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This month Compaq boss, Rod Canion, eats humble pie; bugs are found in Microsoft's Windows 2.0 and dBase III Plus; IBM releases old architecture in its PS/2 series; how to avoid being caught playing adventure games in company time; and delayed shipment of dBase for the Mac.

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Something to say to APC? Share your experiences with other readers via our Letters page.

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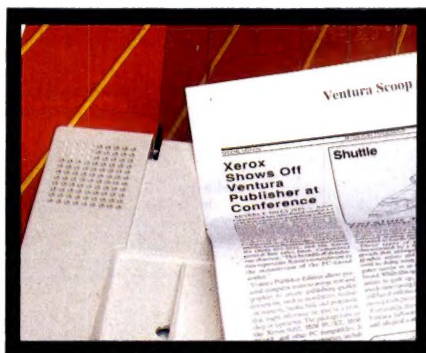
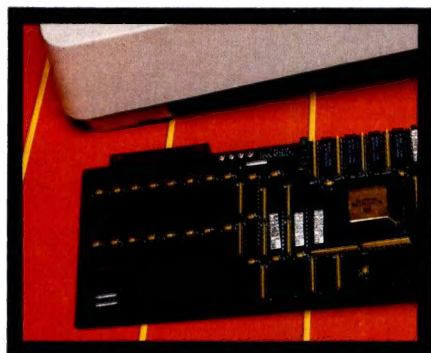
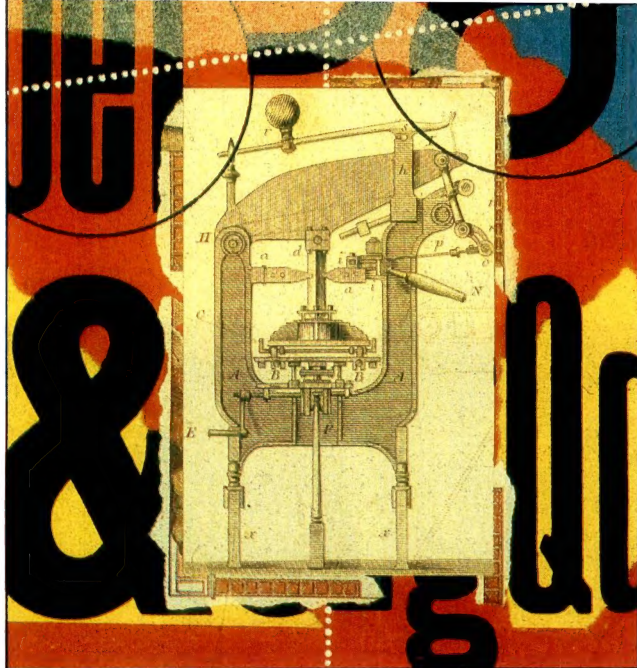
APC's book review panel takes a look at some of the computer literature currently available on the bookshelves.

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A comprehensive list of computer companies in this issue of APC.



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161 LAN BRIDGES IN USE

Making the decision to bridge your networks is the easy part. Making it work can be difficult. Ian Davies takes a look at some of the benefits that can be achieved, and cites a successful bridged network currently in use by Telecom.

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APC and Microsoft are excited to announce the world's largest prize for a programming competition. This is your chance to win \$30,000 and make your claim to fame. Turn to page 37 to find out how to enter.

69 ALL SYSTEMS GO!

With OS/2, Microsoft hopes to lead the way with new operating systems and graphic windowing environments. But will they supply what we want? Robert Schifreen looks at a beta-test version of OS/2, and explains the options for PC/AT and PS/2 users.

119 CONSTRUCTING AN ASSOCIATIVE MEMORY

Have you ever wanted to know how our ability to fix a flat tyre or to play the *Moonlight Sonata* is stored in memory? Look no further. Bart Kosko shows how to construct the simplest non-linear neural-network associative memory.

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Micro programmers have tended to take little heed of their big brothers on mainframes, but there is a lot to learn from them. One such example is the use of structure diagrams. Mark Burgess describes the benefits of this programming methodology.

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To most users DIR often presents a list of long forgotten and cryptic file names. Michael Mefford presents DR.COM — a utility which allows users to sort files by extension, size, date, time, DOS order, and view, rename, move and delete files — without ever having to type DIR.

220 WHAT EVERY DESKTOP PUBLISHER SHOULD KNOW

It's all very well unleashing the average micro user on a heavyweight desktop publishing package, but the results can be hideous. Henry Budgett presents a guide for anyone wanting to create documents on a desktop micro.

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Borland's Turbo C is fast, easy to use and conforms to existing C standards, but the market is well-stocked with powerful competitors. Nick Walker compares Turbo C with Zorland C and Mix C.

85 OMNIS QUARTZ

Five hundred programs are being developed for Microsoft Windows, but there is only one fully relational database among them — Omnis Quartz from Blyth Software. Derek Cohen and Nick Walker take a long hard look at this friendly but powerful database.

101 KURZWEIL DISCOVER

The new Kurzweil scanner isn't cheap but it is very smart. Using artificial intelligence techniques, it is capable of reading printed text regardless of size, font or format. David Tebbutt investigates this ingenious piece of hardware.

111 XPRESS

The Apple Macintosh has always been a popular choice for desktop publishing and now, with Xpress, it offers an even more professional set-up, with unprecedented typographic control over page layout. Graham Jones considers it to be a new standard.

133 ONLINE DATABASES

This is the age of the 'information rich'. No longer is it necessary to scour through the local library or pour over a collection of newspapers to access information. With the aid of a PC and modem, a huge amount of information is available and ready for the taking. Robin Howells accesses Australian and international databases and reports on what each has to offer in this comprehensive survey.

167 DESQVIEW

Owen Linderholm can now run multiple PC applications with true multi-tasking — and most within windows. No, he hasn't taken delivery of OS/2 or a new 386 machine — all this is possible on a standard PC with the latest version of DESQview.

PRINTER SPECIAL

30 PRINTER SURVEY OVERVIEW

Printer technology has taken a back seat in the computer industry — at least up until the arrival of laser printers and desktop publishing. It is now evident that more attention is being paid to the humble printer as we witness the quality increasing and prices dropping.

262 PRINTER SURVEY

APC presents a 30-page survey of hundreds of printers available on the market with all the specifications you will need to help you make your choice.

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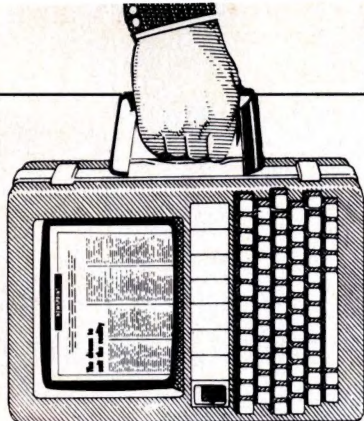
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MiniScribe



Hypertext looks like becoming 'a flavour of the year' (and probably next year). It's already been announced in product form by Apple for the Mac — and IBM users will probably have a range of products before long. This, and the rest of the month's micro news, are presented by APC's experts.

Cake eaten, and kept

We have all vastly enjoyed the spectacle of Rod Canion, boss of Compaq, producing in public the cake he ate three months earlier, when IBM launched OS/2.

On the day that IBM announced its PS/2 systems (2 April), Canion went on record deriding OS/2 as useless since there was no software that used it, and the operating system wouldn't be ready for months, if not years.

In June, Canion changed his tune because his biggest customers came to him, saying (along the lines of):

Dear Mr Canion, We're sorry to hear that you won't be supporting OS/2 on your machines. We have put a recommendation to the board that we go with OS/2, and this, of course, means we will have to remove your machines from the recommended list . . .

He didn't change his tune in private.

He invited several journalists to a New York conference with Microsoft, Lotus, Oracle and DCA (the Irma firm), and paid their air fares and hotel bills, too.

There, he spoke reassuringly about how he could demonstrate OS/2 on one of his machines (and there it was, switching tasks, see?) and there was his very good friend, Bill Gates, head of Microsoft, the company which wrote OS/2.

We sent Owen Linderholm

over to the Big Apple and, after enjoying the show, he buttonholed Bill Gates, producing the short — but sweet — item that follows. *Owen Linderholm writes:* Bill Gates has proved that black is white.

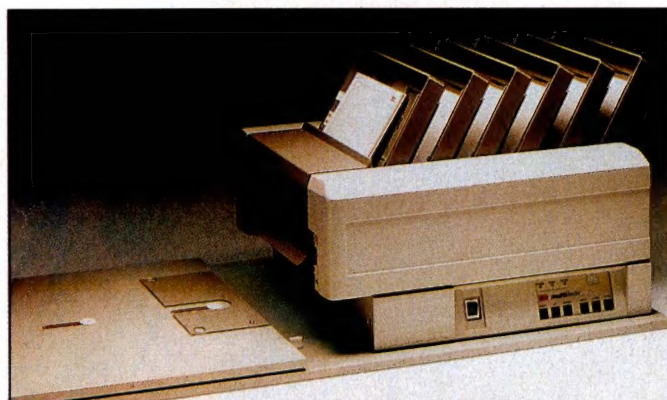
After the OS/2 conference in New York, I had the chance to question Bill Gates more closely about the system — specifically, why it could only run one 'real-mode' task.

A real-mode task is one that can be found on any PC; and, under OS/2, if you are running one of these tasks, you can't use its famous ability to run more than one program at once. All other programs 'freeze'.

Programs exist, like DESQview 2.0 (see review on page 167 of this issue), which manage to run more than one real-mode task. They do it by partitioning the tasks off, on an 80286 machine, and monitoring them to ensure that conflicts don't occur.

Bill Gates had an easy answer: 'It's not worth doing.' An easy answer perhaps, but not one I could accept. This didn't impress him: 'I'm the world's greatest expert on this subject' (operating systems) he said, modestly.

Finding this self-praise possibly true but unconstructive, I pointed out that it was possible to run two 320k programs in 640k of



Companies which have appointed a full time employee to refill the departmental laser printer's paper tray will be grateful for this ingenious (but pricey) device. It's Practical Peripherals' MultiFeeder and attaches to the rear end of a range of laser printers. It allows the selection from the computer keyboard of any of six feeder trays. The advantage of course is not only an increased feeder paper capacity but also a range of paper types. So one feeder may contain plain paper, another letter-head, envelope or form etc.

It retails for \$5000 plus sales tax. If that's too much, ask about the \$3100 three-bin laser feeder.

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memory: and that it was quite possible to run a communications program (like Mirror) in the background, and another program in the foreground.

Gates responded by muttering about "bound to trash the hard disk" and rushed off. I have to admit to feeling rather offended by this arrogant and insulting behaviour — after all, there were plenty of sensible things he *could* have said in reply.

My feelings after the conference and this encounter with Bill Gates are: he tried to hijack the conference as a platform for hyping OS/2,

and for persuading all the major manufacturers to endorse the system before it is shipped.

In other words, Bill Gates is trying to force users to buy OS/2, even before they have had a chance to try it.

This is dangerous — it could lead to the current DOS being left behind as a kind of ghetto for unsophisticated users. But, since many users are quite happy with things as they are, they will resent being pushed into spending more money than they need to.

There was one bright note at the conference: Jim Manzi of Lotus, talking

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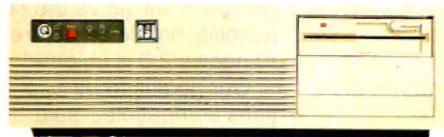
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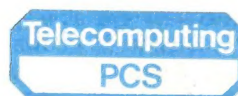


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subscripts, symbols, etc
Metagraphics Metawindow. Turbo-pascal & Turbo C graphics library. 16 colour or monochrome 720x348 graphics. Micro-graphics In-a-vision. Computer aided drawing. 8 colour or monochrome 720x348 graphics in Windows environment. Microsoft Chart. 16 colour or monochrome 720x348 graphics. Microsoft Multiplan. RamFont expands data display from 80 columns by 25 to 90x38 nearly twice data display, with toggle between the two. German and French versions only at this time. Microsoft Word (3.1+). RamFont speeds up this program up to 4 times while retaining its impressive on-screen display of fonts and attributes. Microsoft Windows. 8 colours or monochrome any application running under the Windows environment. Paperback Software VP Graphics. Graphics add-on. 8 colour 720x348 graphics. Earth Imaging System Panacea. Uses RamFont for geographic maps instead of graphics mode. Patton & Patton Flowcharting II. Uses RamFont to display flowcharting icons at text mode speed. Perspective 3D Graphics. Add-on graphics package. 16 colour or monochrome 720x348 graphics. PFS Harvard Presentation Graphics. 16 colour or monochrome 720x348 graphics. San Francisco Design Alexander. Word processor uses RamFont to display special fonts and symbols at text processing speed. Scroll System PS Technical Word Processor. Uses RamFont to display scientific and technical symbols at text processing speed. Soft Evolution SupraFont. RamFont font editor. The Software Group Enable. 16 colour or monochrome 720x348 graphics. RamFont for italics and boldface in wordprocessor. Software Products International Open Access. 16 colour or monochrome 720x348 graphics. Solustan Qalam. Indian language word processor, uses RamFont to display and print 14 dialects. Stella Systems Stella Business Graphics. 16 colour or monochrome 720x348 graphics. STC APL. Programming language using RamFont to display special characters required at text speeds. T&W Versa CAD. 8 colour or monochrome 720x348 graphics. Woodsmith Language Design Kit. Font editor and printing support add-on using RamFont for popular ASCII based programs. ZSoft PC Publisher's Paintbrush. 16 colour or monochrome 720x348 graphics.

A Few Examples...
Here are a few of the programs that benefit from Hercules 720x348 graphics and/or RamFont in monochrome on the Graphics Card Plus and full colour on the InColor Card. Not included in this list are the thousands of monochrome standard text Graphics programs which automatically run on both cards.

Aldus Pagemaker. Desktop publishing. 8 colour or monochrome 720x348 graphics in Microsoft Windows environment. Design Board MegaCADD, a CAD program from 16 colour, or monochrome 720x348 graphics. Unified driver. Ashton-Tate Framework II. Expanded spreadsheet display, speeded up wordprocessor using RamFont. Unified driver. AutoDesk AutoCAD, Auto-Sketch. 16 colour or monochrome 720x348 graphics. Unified driver. Underware Brief. Program editor uses RamFont for 43 line display BPS 35 M.M. Express. Slide production program. 16 colour or monochrome 720x348 graphics. Broderbund For Comment. Editing tool utilizes RamFont for 43 line display. Computer Associates SuperCalc 4. Spread-sheet. 16 colour or monochrome 720x348 graphics.

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lers. So, if two people send information to the printer it will automatically queue." Once the card is installed, 35 Adobe fonts can be downloaded to the printer controller board in the PC. Users will then have access to the entire Adobe font library at all times, Mr Carroll added.

HP officials announced in April that the printer manufacturer would support PostScript, from Adobe.

Last month, QMS and HP announced the signing of an international marketing and distribution agreement for JetScript. Under the agreement, HP has designated QMS as an approved supplier of JetScript, Mr Carroll said.

Watch forthcoming issues for details of availability in Australia and pricing.

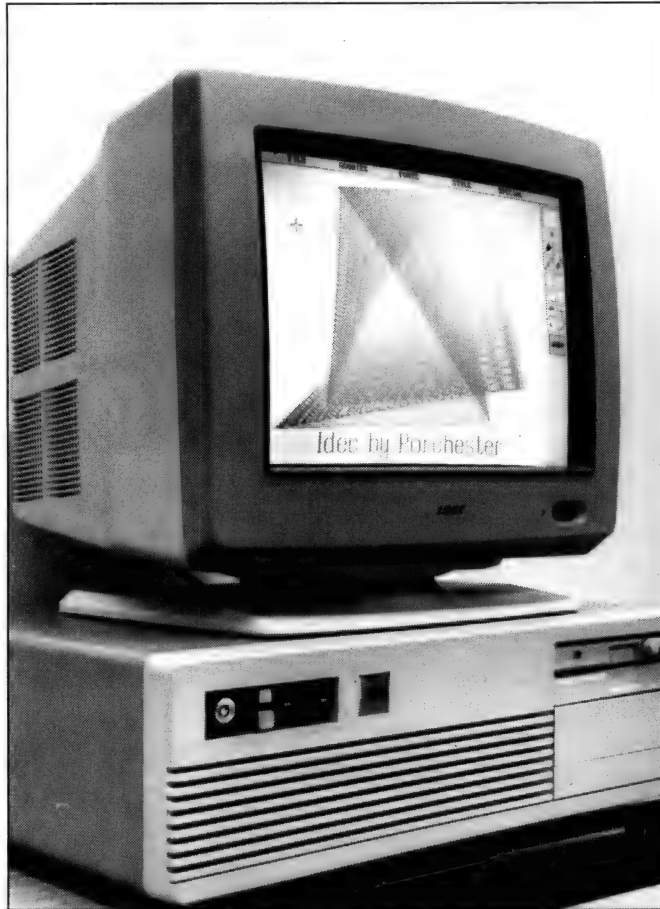
dBase Mac shipment delayed

dBase Mac did not ship on July 31 as had been stated originally; the relational database for Apple Macintosh computers is still in its final testing and debugging stages. The company now plans to ship dBase Mac by the time you read this. Ashton-Tate's managing director in Sydney, Keith van Klink, says he's confident that dBase for the Mac will arrive on our shores in early October. It is expected to retail for \$895.

Microsoft works on its first integrated package for PCs

Microsoft has borrowed heavily from its past successes to develop PC Works, its first foray in the integrated software market for PCs.

Microsoft's PC Works, expected to be released shortly in the US, is based on the Mac Works application developed for Apple Com-



Competition, it seems, is hotting up in the multi-synch monitor market. The above model from Porchester Computers was recently announced with a retail price of \$1845. So we rang Sony to ascertain the going rate for their model.

"\$2220" we were told. So we were about to explain to readers that it would be a good idea to forget the Sony and go for the Porchester unit. But before we had time, Sony rang back to explain that a recent (very recent, we think) revision of prices meant that the Sony would shortly be available for around \$1885.

puter's line of Macintosh computers. The program also makes use of features from other popular Microsoft packages, including Microsoft Word.

A pre-release version of PC Works examined by APC comprises a spreadsheet, database, charting module, word processor and telecommunications program. The new program is character-based, meaning it does not require colour or enhanced graphics adaptors. PC Works runs on 8088, 8086, 80286 or 80386-based computers running DOS 3.X that have 512k of memory.

According to Microsoft Australia's marketing manager, David Svendsen, PC Works is expected to arrive here early November and it is anticipated to cost \$595, the same as Works for the Macintosh.

Analysts, Ms Quindlen and Rich Sherlund, said there is renewed interest among corporate PC users and first-time computer users in integrated packages such as PC Works or First Choice, a comparable program by Software Publishing (SPC).

Data files can be opened from within the program's modules or from outside the

program by typing the name of a data file at the DOS prompt. For files that are opened from the DOS prompt, PC Works will automatically open the application module that was used to create the file.

Within the modules, commands are initiated by pointing and clicking with a mouse on items in drop-down menus or by using keyboard commands. The spreadsheet module in PC Works uses the same .WKS data-file format as Lotus 1-2-3, version 2.0, and can translate most — but not all — Lotus macros.

Using PC Works, users can create Lotus-compatible spreadsheets as large as 256 columns by 4096 rows — which is about half the size of the largest spreadsheet supported in the latest release of 1-2-3. The program's word processing module contains many of the same features found in the Microsoft Word word processing program. PC Works' word processor provides the ability to format individual paragraphs or characters.

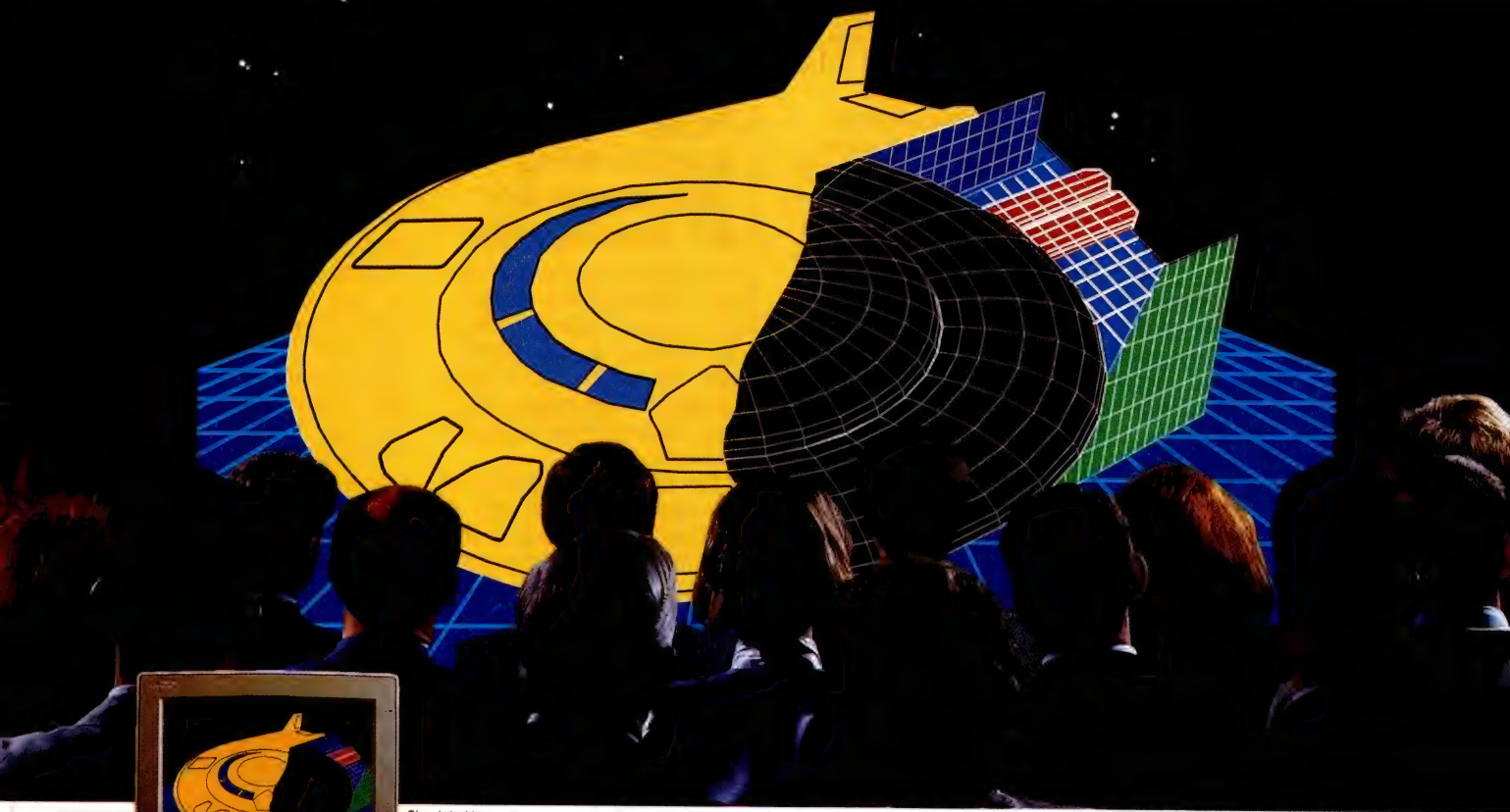
Also supported is the ability to generate form letters and merge them with names and addresses contained in the database module, which can contain as many as 4096 records.

The communications module in Microsoft's PC Works provides VT100 and VT220 terminal emulation and will support data-transmission speeds of up to 9600 bits per second.

The telecommunications module does not support the ability to write incoming data directly to an appropriate applications file. When a communications session is completed, users have to open a data-capture file with the word processing module in order to edit the data.

Microsoft's PC Works could outsell Software Publishing's First Choice, the current leader in the market for low-end integrated programs, said Mr Sherlund. But, he added,

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Software Publishing can't be counted out of the market. "SPC is aware of PC Works and has planned a new release of First Choice to counter it."

AutoShade taps Orchid board power

Two of the industry leaders in computer aided design/manufacturing (CAD/CAM) last month announced active support of Autodesk's AutoShade on the Orchid TurboPGA graphics board.

Autodesk, maker of the industry-leading AutoCAD, developed AutoShade on the TurboPGA. By using the two products together, CAD designers can perform three-dimensional rendering and shading, said Michael Bruzone, Orchid's director of corporate communications.

The TurboPGA is the only PGA (Professional Graphics Adaptor) card offering complete software compatibility with more than 70 programs with every industry graphics standard, including PGA, EGA (Enhanced Graphics Adaptor), CGA (Colour Graphics Adaptor), MDA (Monochrome Display Adaptor) and Hercules, Mr Bruzone said.

"Autodesk supports the Orchid TurboPGA because it offers 32 shades of any one colour, rather than the IBM PGA's 16 shades," said John Forbes, AutoShade product manager.

Another advantage to AutoShade users who choose the Orchid board is the use of Orchid's new PGA Palette Paint Program, Mr Forbes said. The paint program is the only one available for the PGA standard.

PGA Palette enables full use of the 256 colours out of the 262,144 colour palette capability of the TurboPGA. It also provides users of AutoShade, AutoCAD and other popular graphics programs the ability to cap-

ture drawings and enhance them with details, text and hundreds of additional colours, he said.

Orchid products are available from Porchester Computers in Melbourne. Currently, PGA Palette is provided free with every purchase of the Turbo PGA board which costs \$3495. It is not possible to buy the products separately at this stage. Porchester Computers may be contacted on (03) 537 2722.

A spokesperson for Autodesk was unable to provide any details about AutoShade's expected date of arrival in Australia or anticipated price at the time of going to press. Autodesk is on (03) 429 9888.

Bug in dBase III can cause retry errors

A bug recently found in Ashton-Tate's dBase III Plus database program can potentially cause retry errors in certain multi-user situations.

The problem occurs under select instances when a programmer uses the retry command to make an application automatically redo a task that did not work properly the first time.

For example, if two users tried to simultaneously access the same file over a network and received an error message, the retry command would ensure that the process was attempted again until it was successful.

Typically, if a dBase application command issues a retry statement, dBase returns to the line of code in an application where the error occurred and attempts it again. However, if the command that causes the error spans two 512-byte blocks in memory, dBase can't read the entire retry statement so it issues an improper syntax error and doesn't complete the remainder of the task, a company spokesman said.

Ashton-Tate acknowledged

the bug in the February 1987 issue of its newsletter but won't issue a fix, company officials said.

"To handle [the bug], count out each character and make sure that the 512 byte does not fall in the middle of the statement," a spokesman said.

The dBase users who have encountered the bug classified it more as a major headache than as a significant problem.

Faster '286 chip sets to bring '386 power to AT compatibles

The price/performance ratio of '286-based PCs should shift dramatically in the next six months as chip makers use new technology to wring greater processing speeds from relatively low-cost components.

The basic building block of the new machines is expected to be made official this month when Advanced Micro Devices (AMD) announces the 80286-16, a 16MHz '286 processor.

The processor offers a performance increase of 28 per cent over existing 12MHz '286 chips, company officials said. Samples of the chip are currently available, and AMD expects to begin production of the chip in the fourth quarter of this year.

Several chip makers are planning to build chip sets around the new microprocessor, which will result in AT-compatible computers with speeds equivalent to the current generation of 16MHz '386 PCs. Prices of the new machines are expected to be comparable to what 10MHz ATs cost today, said Raj Jaswa, senior product marketing engineer at Chips and Technologies.

One of the foremost contenders in this arena, Chips and Technologies will announce this month a 16MHz AT chip set that, when configured with AMD's 16MHz '286 microprocessor, will

form the basis for a very high performance AT motherboard.

Besides Chips and Technologies, Western Digital and Zymos, are designing similar components that will allow PC makers to build the high-performance machines, officials from both companies said.

But Chips and Technologies leads the pack at this point. Its New Enhanced AT CHIPSet (NEAT) is already sampling and will be shipped in volume to PC manufacturers by the fourth quarter, Mr Jaswa said.

Users and analysts expressed interest in the technology's promises of speed, low cost and compatibility.

"I am looking at the trade-offs between XT's, AT's and the '386," said analyst, Martin Maxwell. "If the price of the '386 comes down enough, the '286 could become an evolutionary dinosaur. But I have a high confidence level in the AT-class machines for right now."

"The unit volume demand for the '386 won't be significant until late 1988 or 1989," said John Maxwell, an analyst with a brokerage firm. "There is a market for the [NEAT] chip set. For the average user, the AT is sufficient."

"Chips and Technologies doesn't have a stranglehold on the technology to develop a 16MHz AT chip set. However, it has been around longer and probably understands the technology better than its competitors. As a result, it can bring a product to market a little faster," said Drew Peck, a semiconductor-industry analyst.

"A few months makes a lot of difference because the vast majority of clones are going to standardise on the chip set that is available first," Mr Peck said.

Chips and Technologies will use a number of techniques to endow its products with the performance improvement. One is a page/interleave

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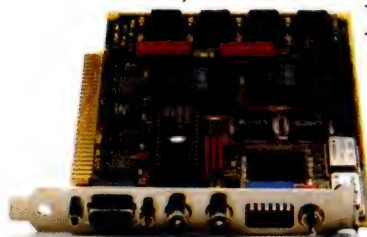
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Naturally, the card should include high-resolution drivers for Microsoft Windows, Lotus (with 120 columns and 43 lines), for 1-2-3 and Symphony. And software support from packages like AutoCAD, Windows, GEM, Dr. Halo, EASYCAD, EGA Paint, In-A-Vision, Windows Draw and Windows Graph. And, of course, a full two year warranty. All of which



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memory technique that allows the PC makers to use relatively low-speed, less expensive (100 nanosecond) DRAM (Dynamic RAM) chips for system memory without degrading the speed of the microprocessor. This is important because higher speed DRAMs are more expensive and have until now forced high speed PCs into a higher price range, Mr Jaswa said.

The memory controller chip of the Chips and Technologies chip set (one of four in the set) incorporates a way to seek the next logical piece of information from memory before the microprocessor requests it — a speed-increasing process similar in concept to paging techniques used in mass storage.

With the advent of OS/2 and Windows applications, user requirements for both speed and memory will increase substantially, Mr Jaswa said.

The Chips and Technologies memory controller chip also incorporates the Lotus/Intel/Microsoft Expanded Memory Specification (LIM/EMS), allowing users to take advantage of several megabytes of memory.

Chips and Technologies has also implemented techniques in the chip set to allow the bus to alternate its speed in order to communicate with slower add-in boards (which usually operate at 8MHz) without significantly degrading the speed of the microprocessor, said Mr Jaswa. This allows the PC to have full compatibility with the AT bus and still maintain high throughput speeds — unlike the PS/2s, which trade hardware compatibility for speed, he said.

One PS/2 feature that Chips emulated in the NEAT chip set is a mode-switching technique that optimises the performance of OS/2, the protected-mode operating system from IBM and Microsoft.



The gentleman with the bigger smile is Justin Beck, Pacific Data Corp's special projects manager. He stands here with Bob Stewart managing director of WordStar Australia.

Mr Beck asserts that Pacific Data "can write at least fifty per cent of MicroPro's total sales in Australia this year".

Some time ago Mr Beck was a director of Technology Corporation of Australia, a firm proposing to go public to raise cash and "emerge a major force in the Australian computer industry". TCA, according to Mr Beck, "was not only a computer company but a high tech company with plans to enter the business and personal communications field in a big way". He even went so far as to say that Technology Corporation of Australia's name "properly indicates the direction in which the Group is headed". Sadly, TCA went in an altogether different direction.

It went broke a short time later.

So if, by chance, you're inclined to take a bet on the fulfilment of Mr Beck's latest prophesy, at least get good odds.

"Compared to a first-generation AT, OS/2 will run 10 to 15 per cent better on a PS/2," said Chips and Technologies product manager Sikander Naqvi.

This is because IBM has implemented in the hardware a facility for speeding the switch between protected mode and real mode — a process the microprocessor will have to do often under OS/2. The NEAT chip set can perform this switch within one microsecond, Mr Naqvi said.

Another speed enhancement of the NEAT chip set is 'Shadow RAM', a technique used by IBM in its PS/2

Model 80 and by other PC makers that allows the BIOS in ROM to be remapped into high-speed RAM after the PC is booted. This lets the operating system access BIOS functions at much higher speeds, Mr Jaswa said.

Both Western and Zymos expect to distribute samples of their chip sets later this year. Western officials said the firm will show 16MHz and 20MHz chip sets in October, with volume production scheduled for this year's fourth quarter or the first quarter of next year. Zymos expects to have samples in September.

LIM EMS version 4.0 brings multi-tasking features to DOS

A major revision of the Lotus/Intel/Microsoft Expanded Memory Specification (LIM EMS), slated for release this month, will allow MS-DOS to support a number of features promised by OS/2, according to sources inside and close to the three companies.

EMS version 4.0 will provide users with access of up to 32Mbytes of expanded memory and some of the new specification's other options such as multi-tasking.

New add-in boards that support the new version should be ready as early as the fourth quarter, according to sources inside Intel's Personal Computer Enhancement Operation (PCEO), maker of the AboveBoard.

Owners of current EMS boards in AT clones who are satisfied with the standard 8Mbytes of expanded memory will be able to run any software written to the new specification by adding software drivers from various board manufacturers, which should be available late this year or early next year, sources said.

Software that supports the new specification will likely be available later this year or early next year.

Lotus' 1-2-3 Release 3.0 and Microsoft Windows 2.0 and Excel for the PC will be among the first crop of programs to support the new LIM specification, said sources inside the two companies.

PCEO and Microsoft officials declined to comment. A spokesman for Lotus said version 4.0 "is under development, and we have been working closely with the other parties to make sure it meets the needs of users in light of new technologies."

The LIM EMS, announced in 1985, gives software access to more memory than

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below. To do this, we used HP's new ScanJet desktop scanner, MicroSoft Windows and Pagemaker from Aldus.

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Mr. J. C. Ryan, President
Flossmoor Soup Company
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August 1, 1987

Dear Mr. Ryan:

In an effort to help you stay competitive, we are publishing 5-year sales projections for two soup categories: canned and dry. Please keep these projections handy as they will aid you in your product planning over the coming years. Of special interest to you are the dry soup projections.

	CANNED	DRY
1987	\$6,700,000	\$1,100,000
1988	\$7,300,000	\$2,100,000
1989	\$8,400,000	\$2,600,000
1990	\$9,300,000	\$4,800,000
1991	\$9,900,000	\$7,300,000

As you can see, industry experts project that the gap between dry and canned soups will begin to close by 1990. They also believe mergers will follow.

Noodle Price Hike

Bad news this month comes from TNG (The Noodle Group). By year's end, they project the price of noodles to double - up to eighteen cents a barrel. How will this price hike affect you? A two-cent per can increase on all noodle soups you sell.

Recommended Reading: "Cup or Bowl"
This in-depth study discusses the habits of the American soup eater. Call and I'll send you a copy.

Sincerely,

Mr. R. Welke
Mr. R. Welke
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NUTS

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the 640k DOS limit. By installing a LIM card with the current version of EMS, programs can utilise up to 8Mbytes of additional memory.

Sources said version 4.0 — the first major revision of the EMS specification — has 15 new software functions and 39 new sub-functions for software and operating system developers. Although they declined to elaborate, the sources said the new functions make it easier to develop programs that incorporate these features.

With the new LIM specification, Lotus 1-2-3 Release 3, for example, will be able to support 'multi-dimensional linked' spreadsheets and expanded macro capabilities — features that were not expected to be available to users until the release of OS/2.

The ability to run several programs simultaneously — another feature promised by OS/2 — is also supported by EMS version 4.0. This will allow users to load several application programs into memory and switch between them using a multi-tasking operating system, such as Unix, or the so-called DOS control programs, such as DESQview, from Quarterdeck Office Systems.

With the new features, version 4.0 will make DOS an alternative for companies considering OS/2, allowing them to make the transition from DOS to OS/2 over a longer period of time, said David Thomas, a technology analyst, who is familiar with the new specification.

The new version will allow the old generation of computers to run applications similar in functionality to those designed for OS/2, which requires a significant amount of memory, said Mr Thomas.

"If customers want to go with OS/2, they can, but with version 4.0, they will not be forced to go that route," said a Lotus source. Added a source inside Intel:

"Version 4.0 breathes new life into DOS and provides a taste of what OS/2 will be like."

DosEdit's lurking memory

When playing an Infocom adventure on a PC-compatible, use DosEdit. But beware! If you are playing something like Lurking Horror, DosEdit will give you away to your colleagues.

DosEdit is one of those indispensable programs of unknown origin, which was 'found' inside Microsoft. All it does is repeat the last command given to DOS.

Normally, you can do that with the F3 function key. What makes DosEdit nice is that it remembers the previous 15 commands, too. And it lets you edit them.

So, when you type a complex command such as: `pco /r/m = %1/q1 = c:\out\pro.cfg` and then find that you should be in a different directory, you can type 'cd\pco', hit the up arrow, and the previous command will reappear.

And if, in an Infocom game, you type: get red indian head-dress with cowboy lasso and the system says 'You Already Have It', and you realise it was really the Spanish sombrero you wanted, then don't retype — just hit the up arrow.

But don't be too sure you're safe. Most Infocom games are played by 'serious computer users' at their place of work. And it is generally regarded as good policy, when a supervisor happens by, to be working on something less entertaining — a spreadsheet, perhaps, or copying a list of files onto someone's floppy.

Unfortunately, DosEdit will remember the last 15 commands you typed in Lurking Horror. It can be embarrassing to hit one too many up arrows after typing: `copy *.dif c:\lotus\bak\` if the last command you gave the game was: kill professor with magic stone.

Guy Kewney

Graphics software offers easy links

In a new release of its presentation-graphics program, Chart, Microsoft has added links to statistical, database and spreadsheet data residing on a local area network (LAN).

The update, Chart version 3.0, also offers an expanded set of data analysis tools, the ability to create three-dimensional charts and built-in mouse support.

The program's links to data on the LAN can be set up to be direct and dynamic, meaning that when the user changes data in one program, the changes will automatically be reflected in another 'linked' program, according to Microsoft officials.

Chart 3.0 costs \$790 and is available from Microsoft dealers. Registered users of earlier Chart versions can upgrade for \$175.

Like version 2.0, Chart 3.0 allows a direct dynamic link to data from 1-2-3, Multiplan, dBase, SPSS/PC+ and other applications software programs. Because a direct link with these source programs is established, any data that is changed in the application program is automatically updated in the linked chart, explained John Fitzpatrick, the Microsoft product manager.

New to Chart 3.0 is the direct-linking capability with LAN support. Using a LAN that runs Microsoft's network software or any PC-NET-compatible network, users can gain direct access to external data that is stored on a file server and exchange custom chart formats, according to Mr Fitzpatrick. Chart 3.0 includes record locking and password protection to manage files that are being shared.

In a networked environment, permanent links can be set up between Chart 3.0 and applications software programs.

A separate LAN software utility for Chart 3.0 is required. In a five user configuration, the software is supplied with Chart 3.0 and five manuals and costs \$2085. New analytical tools featured in Chart version 3.0 include an array of transformations, regressions, moving averages, descriptive statistics, mathematical calculations on data series and line smoothing. Also, Chart 3.0 can accommodate up to 32,000 data points per chart; this is up from the 128 data point total of Chart version 2.0, according to company officials.

In addition to its gallery of 48 predesigned formats, Chart 3.0 lets users create a 3-D effect for bar, pie, column and line charts. For text charts, version 3.0 adds text alignment, line spacing, text rotation, bullet symbols and line drawing.

Using an IBM Enhanced Graphics Adaptor (EGA) or Video Graphics Adaptor (VGA) card, charts can be displayed onscreen in 64 colours. Chart version 3.0 can also work with up to 177 colours for output on 35mm slides, plots prints or video images, according to company officials.

A Portable resurrection

You believe that a product launched by IBM will sell because of those three magic letters, don't you?

I received a short, terse illustration of just how false that theory is when I was scrolling through The Source, a (costly) American bulletin board recently.

The Source quoted the Boston Computer Exchange, which reflects the prices of all micro systems new, second-hand, obsolete or simply available. And it had prices for the IBM Convertible (the laptop machine).

I was highly amused to find that the Convertible had reached a high point, on the open market, of \$US650. That was the maximum

price you could hope to get, were you a dealer; and (a footnote added) you'd be lucky to find anyone interested, even at that price.

Amusingly, there was another IBM computer there — the Portable. The Portable was launched a couple of years after Compaq launched its machine, in an attempt to take Compaq's market away. Software which would run happily on the ordinary PC and the Compaq, wouldn't run on the Portable; and, after a few unhappy months, IBM began to deny that it was no longer making the Portable. Then it did stop making it.

The Portable, obsolete, unloved and out of date, now sells for \$US100 or so more than the Convertible.

I assure you that both machines have the letters 'IBM' emblazoned in large friendly script all over them. **Guy Kewney**

GraphWriter II automates data-retrieval process

A new version of Lotus's GraphWriter business graphics program supports a Lotus-style interface and menu structure, and also automates the process of retrieving spreadsheet data for charting purposes, according to sources who have seen the new software.

GraphWriter, a \$970 program that produces standard business charts and graphs, has not been updated since Lotus acquired the package and its parent company, Graphics Communications, in early 1986.

Lotus officials declined to comment on details of the new program, called GraphWriter II. However, Dave Tarrant, general manager of Lotus's Graphics and Document Products Division, acknowledged that the company is committed to extending its GraphWriter development.

IBM in the US has rounded out both the low and high end of its PS/2 line with the introduction of the Model 25, a low-cost machine aimed at the education market, and a new version of the 80386-based Model 80 with higher storage capacity for use as a file server on a LAN for advanced scientific applications.

The Model 25, priced at \$US1350 for a monochrome configuration or \$US1695 for the colour-display version, is a small-footprint, self-contained 8086 computer that features one 3.5in, 720k, floppy disk drive; 512k of memory expandable to 640k; two expansion slots; and a built-in, 12in analog monitor.

Although the machine's packaging looked slick, many educational PC buyers were sceptical about the Model 25's power and its upgrade potential.

"It's a beautiful machine. It's sleek and slim," said Eydie Sloane, publisher of the Sloane Report, a newsletter which focuses on the use of computers in education. "However, the machine uses ancient technology — for example, the 8086 chip. If IBM is re-establishing an industry standard, why are they giving [the education market] a low-end entry model that uses old architecture?"

IBM's first attempt to break into the educational market was the PCjr. It was not well received by the public, and IBM discontinued it in 1985.

Anthony Schaller, a sys-



tems development manager said that because the Model 25 uses the 8086 microprocessor and lacks an upgrade path to the Micro Channel architecture used in the rest of the PS/2 family, "Most students will go for a higher performance machine."

Other features of the Model 25 include the same graphics capabilities as the PS/2 Model 30 — 256 colours out of a palette of 256,000 — and the new Space-Saving Keyboard, which offers the same layout as the standard PC keyboard but without the numeric keypad, making it around six centimetres smaller.

Options for the system include a \$US170 second floppy disk drive, a \$US49 128k memory expansion kit and a \$US314 Collegiate Kit.

While IBM did not announce a hard disk drive for the Model 25, sources inside the com-

pany said such a drive is forthcoming. Both versions of the Model 25 are available in the US immediately through IBM's authorised dealers. IBM also released a version of its Model 80, an 80386-based machine identical to the earlier offerings except for the inclusion of a high-performance, 314Mbyte, fixed disk drive. The new Model 80, priced at \$US13,995, can also be equipped with a second 314Mbyte drive for a maximum capacity of 628Mbytes. Both the Model 80 and the \$US6495 disk option will be available by the first quarter of 1988.

A spokesperson for IBM Australia said that the company is reviewing the products but no decision had yet been reached as to whether these models would be introduced to Australia.

APC is not sticking its head out when it says that they'll be here.

"One area of key importance to GraphWriter is the way in which spreadsheet information is linked to charting information," Mr Tarrant said. "We are developing

GraphWriter with those goals in mind."

Unlike the current version of the program, the new release will allow users to select ranges to be graphed

from their worksheet files without having to exit GraphWriter, several sources said.

Users can name a range, and GraphWriter will



And you thought the others were good

The Mannesmann Tally MT910 has redefined the price/performance standard in desktop, laser printers. Features such as dual bin feeder, high resolution graphics, selectable/downloadable fonts, 10 pages per minute, letterhead, envelope and overhead transparency printing, plus a combined 500-sheet holdings capacity. All listed as options with most other lasers.

The MT910 maintains software compatibility with standard printers such as the Epson (FX), IBM Proprinter, HP LaserJet, Qume and Diablo. MPA can even supply a shared interface device so that it can be shared by four separate computers.

But, most importantly, the MT910 is supplied by MPA, the company known for its excellent service and support standards.

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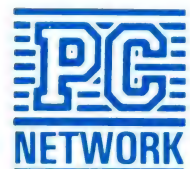
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automatically go out to disk, retrieve the worksheet data and graph it, sources explained. A built-in window feature also lists the available worksheets in case a user forgets the name of the range he or she wants to graph, they added.

Another feature that links GraphWriter II more closely to a spreadsheet is its ability to automatically reflect a change in the worksheet without the user having to reset a graph.

For example, if a user changes the size of a range by adding another year, the change will be reflected accordingly the next time that graph is called, according to the sources.

GraphWriter II also lets users write scripts to design graphs — a feature that automates the process of creating a set of graphs that are needed regularly.

While corporate users and industry observers were pleased by GraphWriter's prospective ability to link spreadsheet data with graphics, most were more enthusiastic about its change of interface.

"It sounds like they're adding things other graphics programs already have," said John DeBay, a GraphWriter user. "It's important that the menu structure [of GraphWriter] be Lotus-like to increase the learning curve."

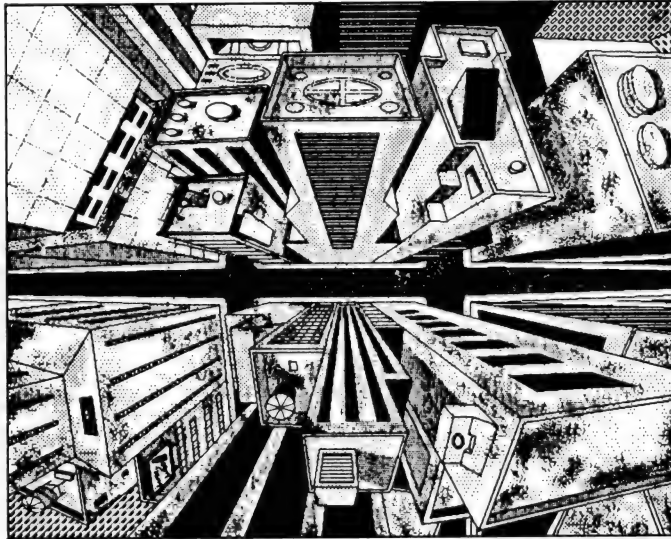
GraphWriter is one of two graphics programs offered by Lotus; the company also markets Freelance Plus, a \$970 free-form graphics and editing package.

GraphWriter II is expected in Australia around mid-October and is anticipated to retail for \$970.

Lotus products are available from Imagineering on (02) 697 8666.

DTP package aimed at 'everyday' users

Ashton-Tate has entered the low-end desktop publishing



SuperPaint for the Macintosh is quite a lot more than a 'latest version of' MacPaint.

Where MacPaint lets you put text into pictures but treats it like graphics, SuperPaint treats it as text which you can actually edit.

Where MacPaint sees only pixels, SuperPaint sees 'shapes' and has a 'draw' layer where they can be moved.

There are multiple windows, and a whole host of goodies like 300 dots per inch 'laserbits', and dot-by-dot editing of pictures at ultra-high resolution.

Full details can be obtained from the importer, Imagineering. SuperPaint retails for \$138.

market with a program designed to improve the appearance of database-driven directories, price lists, inventory reports, memos, newsletters and overhead presentations.

The program, called Byline, is designed for the 'everyday' business user who is not trained in the field of graphics arts or typography, according to officials at Ashton-Tate. Byline was developed by Ken Skier, president of SkiSoft.

Features of the program include its ability to import files from several word processing, database and spreadsheet programs.

Byline directly imports and exports files created in Ashton-Tate's MultiMate word processor, WordPerfect and WordStar. Lotus 1-2-3 worksheets and graphs can be imported into the program.

A limited number of design features are also built into the Byline program.

Microsoft translator converts Turbo Pascal to C

Microsoft officials hope Turbo Pascal programmers will soon be recompiling their programs using its translator, which converts Turbo Pascal source code to Microsoft Quick C code.

The as-yet-unnamed translator utility will be released in September in the US after the company begins shipping Quick C, said Rob Dickerson, Microsoft's group product marketing manager for languages.

The translator will enable Microsoft to tap the huge installed base of Turbo Pascal packages, estimated at 600,000 by its developer, Borland International. Borland officials declined comment.

"We want to paper the world with this thing and give Turbo Pascal program-

mers a straight forward way to get their code up under C," Mr Dickerson said. "If you have Quick C and you get this translator, even if you aren't a C programmer, you could port your stuff across and compile it and have smaller, faster programs."

It is likely the translator will be supplied free of charge in Australia to anyone who requests it after Quick C's release here in October.

Programmers said one reason to move from Pascal to C is that C is a very portable language that runs under a variety of operating systems, whereas Pascal is usually operating-system specific.

The programmers also said that translators are sometimes criticised for the unwieldy code they generate.

Mr Dickerson, however, said the Microsoft translator generates 'pretty' Quick C code. "There'll probably be something somewhere that won't translate, but we're pulling off translations of all of the publicly available Turbo Pascal programs," he said.

"The intent is for it to be able to translate 100 per cent of Turbo Pascal code."

After using the translator, programmers simply recompile the generated C code under either the Quick C or Microsoft C 5.0 compilers, said Mr Dickerson.

Additionally, programmers can use the utility to convert other types of Pascal code besides Turbo, he said, although the conversion would not be as 'perfect.'

The translator runs on PCs with 340k of memory, two floppy disk drives and DOS 2.0 or higher.

When the chips are down, Intel strikes

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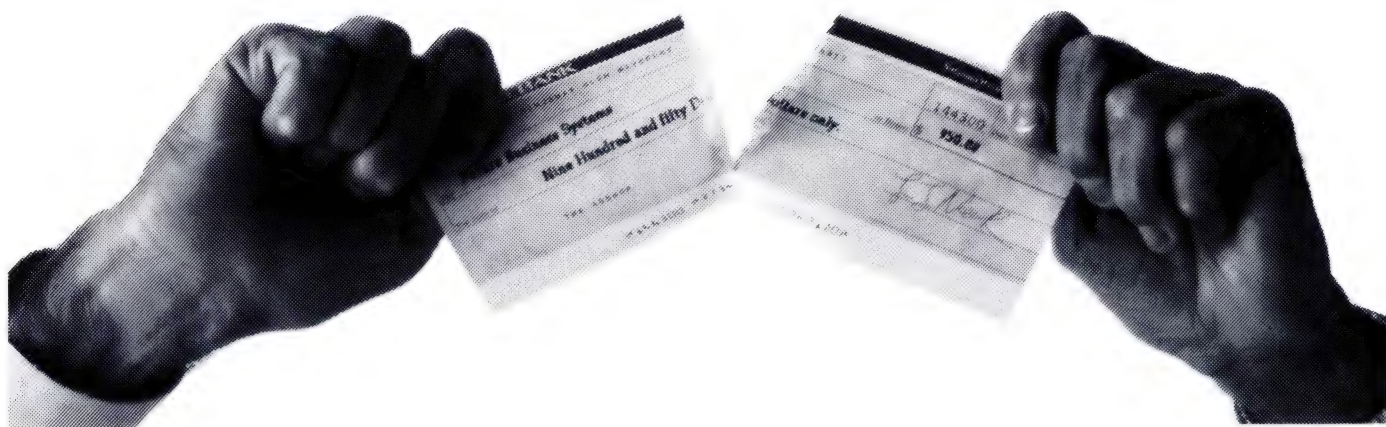
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line of business, it is not the company's *only* business.

Sources close to Intel claim that this leading-edge company is working diligently on many products, including some similar to those which Chips and Technologies (C&T) has developed in the way of chip integration. Intel plans to give C&T a real run for its money on comparative VLSI products.

However, Intel's PCEO group in Oregon, has been busy, too. This is the division which produces various Intel-labelled memory expansion boards, maths chips and add-on cards.

Now, this entrepreneurial part of Intel is jumping on the PC/fax card bandwagon and is about to release a card of its own.

Designed for PCEO by SpectraFax, a small company in Florida, this card will fit into the PC and turn a desktop computer into a fax sending and receiving device.

It will have its own fax modem onboard, and Intel insiders claim that it will offer features which most of the other boards on the market do not presently have.

This development is Intel's first foray into the complicated field of communications, and could be a sign that the company is looking seriously at modem chips and advanced communication logic devices.

Considering the strong competition that Intel is receiving from Motorola and Texas Instruments, it makes sense for the company to enhance some of its capabilities and examine new areas to broaden its product line.

The Intel fax card should be available by the end of the year.

Tim Bajarin

Sony's portable video system

As a constant traveller who

often finds himself stranded in airplanes and hotels, I have fantasised about a combination TV and VCR which I could pack into my briefcase and carry with me wherever I go.

I could watch a colour VCR tape even while hurrying through an airport terminal or while standing in a queue waiting to buy tickets, if I so desired.

Word is just beginning to leak from Japan that Sony is actually showing a device like this to selected dealers, and could have it on the market by January 1988.

Called the Personal Video, it is about twice the size of a standard Sony Walkman, uses 8mm video tapes that are the size of audio cassettes, and has a built-in 5in TV screen which will have an improved flat-panel, liquid crystal display. It will use conventional NiCad batteries, and can be recharged to give four hours of use.

The Personal Video is expected to cost between \$1500 and \$2200.

Although Sony does not plan to launch this combined unit until next year, it will have, by the end of *this* year, the first product in its 'Personal Video' line. This will be a plug-in VCR and TV unit which has been designed for busy desks and kitchens. It will use Sony's standard 5in Trinitron tube and is expected to cost less than \$2200.

Tim Bajarin

PostScript: Apple's slice of the pie is cut

For some time now Apple has enjoyed a long spell as the price-setter for laser printers. The standard LaserWriter retails for \$9690 while the LaserWriter Plus costs around \$11,069.

But, now that AST Research has introduced an under-\$9000 PostScript printer (available from Im-agineering in October), you

can expect to see Apple — as well as Digital, Texas Instruments, Wang and QMS — react quickly to these new pricing pressures.

At the same time, IBM could be forced to lower the target price of its PostScript printer which, at the time of writing, is still under wraps.

In the meantime, Hewlett-Packard (which recently announced support for PostScript) may find it necessary, because of these lower OEM prices, to deal directly with Adobe instead of sub-leasing a printer from QMS, as has been widely speculated.

Adobe has been charging a standard \$US200,000 OEM entry fee, plus a hefty royalty tied to each laser printer with PostScript on the system. As a result, the prices of the PostScript printers have stayed high.

But, the new, lower prices reflect the pressure which Adobe is under from the PostScript clones that are being announced almost daily.

Adobe's most formidable opponent seems to be Phoenix Technologies. Rumour has it that this company, known primarily for its PC-clone BIOS software, will produce a PostScript clone superior to Adobe's.

Although this is bad news for Adobe, it is great news for consumers. Within 12 months, we could see PostScript, or PostScript-compatible, printers as low as \$5000.

Tim Bajarin

EGA prices erode

Evidence is mounting that IBM's VGA will be the next widely-accepted graphics standard. Prices for both the standard EGA (640 by 350 pixels) and higher resolution 640 by 480 boards have been dropping and a swathe of manufacturers have announced their intention to produce VGA-compatible boards which will work with existing PCs.

One such manufacturer is Tseng Laboratories which has both cut the price of its existing high-resolution EGA board to \$499 from \$899 and introduced a 1024 by 768 pixel VGA-compatible chip.

The EGA board is sold in Australia by NEC Home Electronics and boasts an extremely fast zoom feature. The VGA chip is not yet marketed here. Dealers interested should call Tseng in Taiwan on (2) 712 1075.

Revised version quadruples expanded memory

A new release of the Lotus/Intel/Microsoft Expanded-Memory Specification (LIM/EMS) offers a number of new features, including the ability to address four times as much memory as the previous version and support for multi-tasking of applications.

Version 4.0, announced last month in a joint press conference by the three companies, increases the amount of expanded memory available to users from 8Mbytes in the old standard to 32Mbytes. The new version also offers enhanced support for software written to execute in expanded memory. Under EMS 4.0, multiple applications can run simultaneously.

Intel next month will release, to registered owners of its boards, software drivers based on the LIM specification that allow those products to work with the new LIM versions, Mr Bader said. AST officials said drivers for its boards will be available by year's end.

Support for the new version of EMS came from many quarters. In addition to Microsoft and Lotus, software companies, including Borland and its Ansa subsidiary, embraced the new standard and promised to support it in future versions of their programs.

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Quarterdeck Office Systems announced support for the new specification in a new version of its Quarterdeck Expanded Memory Manager-386 (QEMM) for 80386-based machines, and a new QEMM product for PS/2 Models 50 and 60.

Lotus officials said future versions of its programs — including release 3.0 of 1-2-3, due in the first quarter of 1988 — would take advantage of two key features of the new LIM: multi-tasking and dynamic linking.

In fact, the new specification gives users some of the capabilities promised in the OS/2 operating system due next year, allowing the migration to the new hardware systems and operating systems to occur over a longer time span.

For corporate users, the new EMS version means they won't have to wait for OS/2 applications that offer multi-tasking capabilities, said David Reed, a Lotus vice president.

Borland confirms its plan to offer spreadsheet

Borland has confirmed its plans to offer Quattro: The Professional Spreadsheet, but has offered scant information about the program.

The 1-2-3 compatible package offers presentation-quality graphics, fast spreadsheet calculations and operations, a complete macro development environment and a customisable user interface, Borland officials said.

The firm has yet to determine the package's price, however.

Borland President Philippe Kahn confirmed the spreadsheet will be sold through Borland's worldwide network of dealers and distributors and through Ansa's direct corporate sales force. He said it will ship before the end of the fourth quarter. Borland's beta testers seem impressed with Quattro.

"Recalculation is just fantastic; you can easily see performance increases over Lotus 1-2-3 of three to four times," said Doug Cobb, president of The Cobb Group of Louisville, Ky., the publisher of business software books and journals. Mr Cobb plans to publish a book on Quattro.

"The graphics are vastly improved over 1-2-3. And it lets you customise the user interface."

Borland beta testers confirmed the program's use of sparse matrix technology or minimal recalc, which improves the speed of recalculations.

Hypertext begins to appear in micro programs

Hypertext, an information-management technology still in its infancy, could become a strategic corporate resource in as few as five years, according to industry experts and corporate executives.

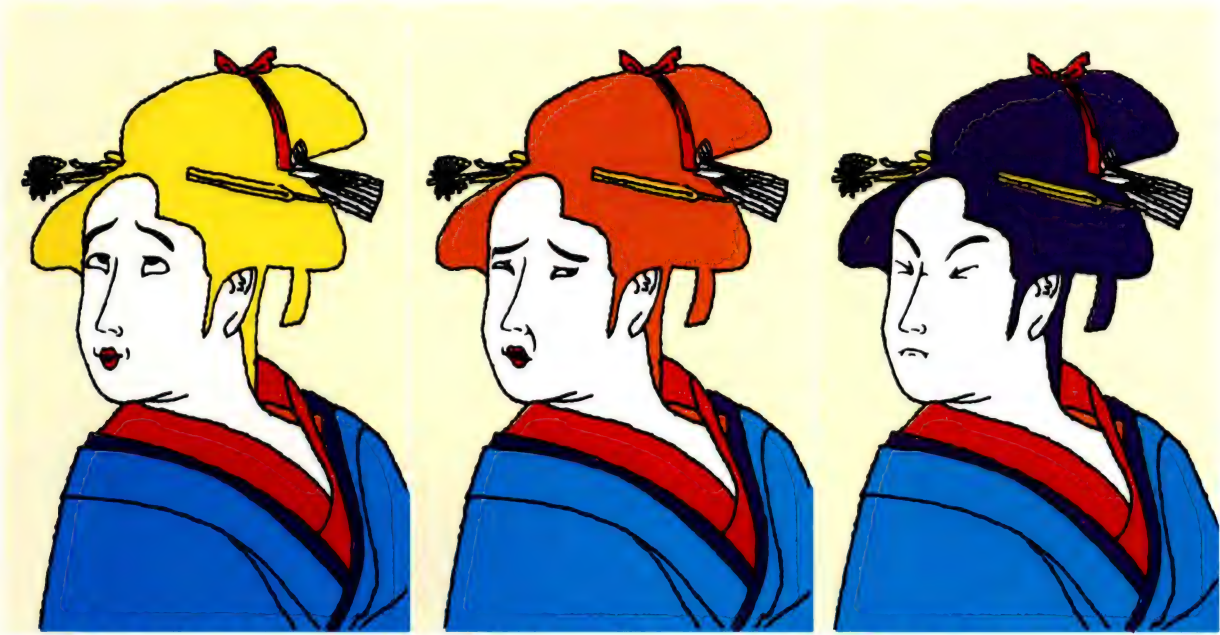
Hypertext programs, which are just beginning to appear, allow personal computer users to quickly search and retrieve text, graphics, video images and digitised music stored in large databases and then to compose electronic documents containing any combination of the gathered data.

The hypertext concept, which was first proposed by academics in the mid-1970s, builds upon several kinds of software applications — including high-speed search and retrieval, data compression, data translation and imaging software — that allow users to actually assemble on screen a dynamic, electronic document with links to many other data files.

Before hypertext can be widely implemented in a PC environment, however, the cost of a number of key hardware components must fall, according to computer scientists.

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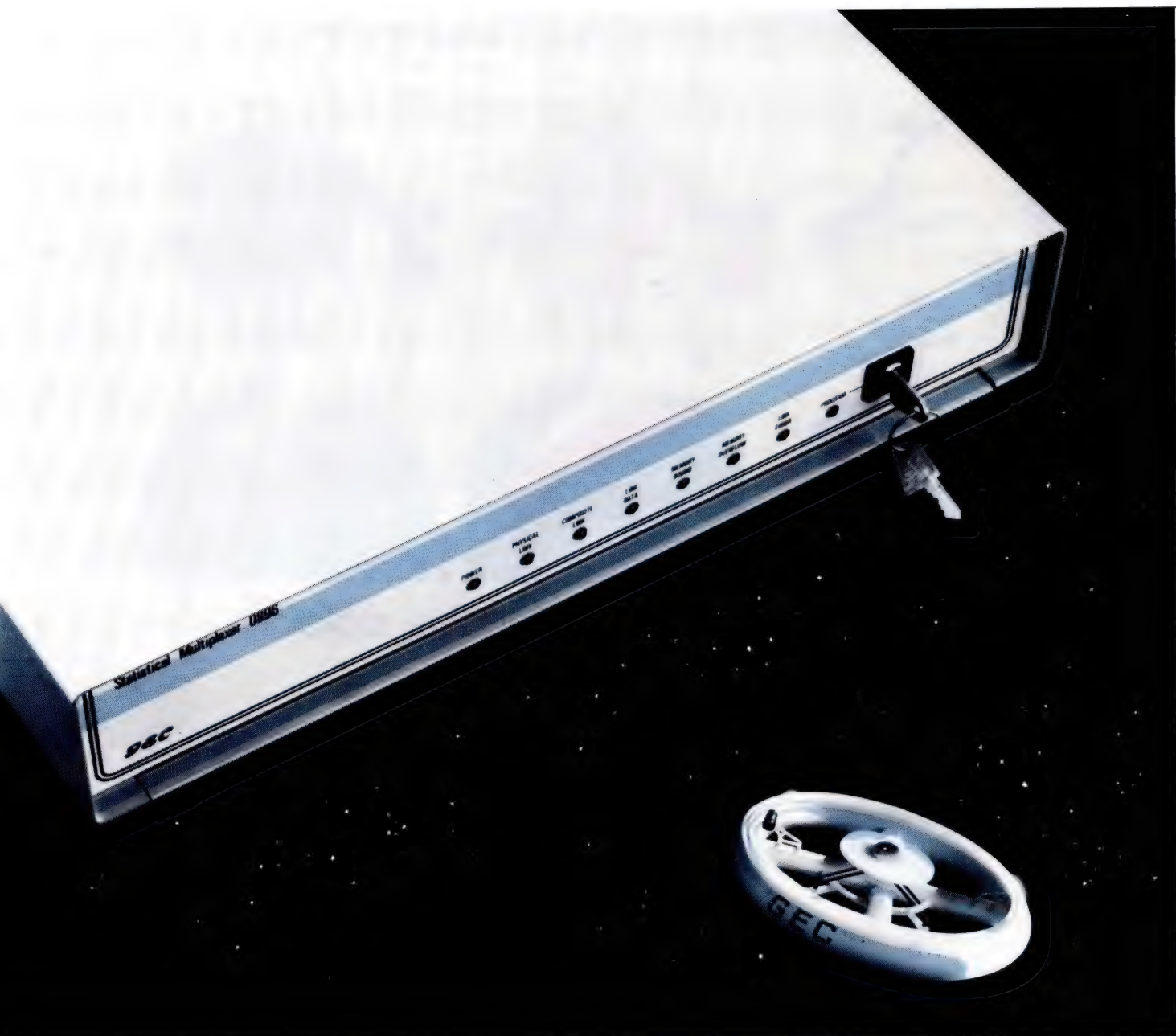
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patibles] PC hardware costs associated with hypertext environments — high-resolution monitors and display adaptors, CD ROM units and other peripherals — to drop before there is a real market for this type of software," said Robert Shostak, a vice president with database manufacturer Ansa Corp.

Still, commitment to the hypertext concept is growing among hardware and software suppliers and some corporate users, according to Thomas Mandel, a researcher with the SRI International think-tank organisation in Menlo Park, California.

Mr Mandel cited the recent release by Apple of HyperCard, a hypertext program for the Macintosh Plus, SE and II computers. Owl International, another US company, subsequently announced that it will provide equivalent functionality for PCs with a revised version of its hypertext-like program, Guide, which runs under Microsoft's Windows for the IBM PC environment.

Apple's HyperCard was written chiefly by Bill Atkinson, a veteran Apple scientist, who said it took him and others about three years to complete the Macintosh

program. First demonstrations of HyperCard-based systems last month at the MacWorld trade show by such on-line database suppliers as Dialog indicate that the new technology will best address the needs of libraries, universities and market-research organisations, primarily because of high data retrieval speeds, Mr Mandel said.

"Hypertext systems let people look at data in ways they've never been able to before," he said.

For example, a hypertext financial-marketing model could integrate real-time inventories with up-to-the-minute sales information and sales projections obtained from an on-line source, providing corporate executives with faster, more flexible ways of evaluating actual performance versus predicted performance.

"There are a lot of corporations — particularly marketing-driven companies — dependent on specific applications, that can benefit from hypertext applications," said Mr Shostak. Because hypertext documents can contain linked files that are limited in number only by the constraints of the system, corporate users looking to develop their own information systems could more ef-

fectively create documents containing graphics linked to text; these in turn can be linked to a database of video or other data files, Mr Shostak said.

However, when shared among large numbers of users, there is a real potential that hypertext documents could become unmanageable, said Robert Carr, a chief scientist at Ashton-Tate. The CPU could be tied up as the hypertext program moves from one database to another, he said.

Also, because hypertext documents are image-oriented and incorporate multiple types of information, it may take some time for users to become familiar with a new way of handling data, said Jeff

Ehrlich, manager of product technology at General Electric. Even so, corporate MIS executives given prerelease copies of HyperCard by Apple expressed interest in hypertext's potential.

"The uses for it are so varied that, in its present state, we are seeing more demonstrations of potential applications than real applications," said Mr Ehrlich.

Bludner

It seems we (or the PR firm concerned) got IDEAssociates telephone number wrong in last month's Newprint item on the IDEAcomm 5251 board. IDEAssociates is on (02) 387 5222.

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Printer overview

believes that the daisywheel will not just lose out to lasers, but will also continue to be eroded by the continuously improving dot-matrix machines.

Speaking out in defence of the daisywheel, however, is a spokesman for Brother's daisywheel machines. "Certainly enhanced dot-matrix and laser printers have had a big effect on the daisywheel market," he said, adding that "in many cases the effect has been enough to force manufacturers out of the market, but Brother has no such plans and is in fact picking up more sales due to the decreasing number of contenders in the market." He believes that many low-cost daisywheels have been going to users who have bought a low-cost PC and want a similarly priced, but high-quality printer to go with it.

He also points out that even 24-pin matrix printers still produce output that is clearly made up of dots. "For the perfectionist even enhanced dot-matrix output is not as good as daisywheel," he maintains. The future for daisywheels is likely to be in vertical 'quality output' markets such as legal work.

With regard to the speed of product development and enhancement in the dot-matrix market, Epson quotes a typical lifespan of only 10 to 12 months for its printers. "That's as long as they can last without an upgrade," he says, "which will usually be to both speed and quality."

This pressure for continuous development is primarily due to the fact that printers have to mirror whatever is happening in the PC market itself. Although matrix printers started off in data processing applications, speedily producing reams of draft quality print-out, they now accompany the PC in the whole gamut of business applications.

As a result the dot-matrix printer market is now made up of a mass of general-purpose units than can be con-

figured to any one of these applications, but are 'jack-of-all-trade' machines and are not particularly good at any of them, supplemented with an increasing number of more specialist dot-matrix machines.

Selecting from the mass of general purpose machines should theoretically be easy as there is a good selection at each point in the price spectrum from \$400 to around \$4000. There are usually also clear market leaders at each point, but as with the IBM PC these often get to the number one slot by virtue of the marketing muscle of the manufacturer rather than technical brilliance.

As with any type of purchasing decision it helps to know as specifically as possible what the printer will be used for, what equipment it will be used with and any near-future plans to expand the application in any way.

If nothing else, this basic knowledge will help to ensure that the printer has the right interface(s) and comes with the necessary paper feed devices.

In many cases one or other will not be included as standard, in which case it is worth shopping around to see if it is possible to buy a unit with the required add-ons included so avoiding extra add-on costs.

It is also well worth trying out one or two of the printers that fit your bill, as many manufacturers are now turning to the 'user interface' to help make their products stand out from the crowd.

Ideally most of the printer's functions will be easily selectable from the front panel of the printer rather than via the traditional, awkward dip-switch method and in many cases the character pitch (characters per inch) will be dial-selectable from the front panel rather than via obscure downloaded commands. Also look out for protection against overheating and design attributes to minimise the noise level.

Non-impact printers

Broadly speaking the non-impact printer market is far from an equal three-way fight. The heavyweight is undoubtedly laser-printer technology and close relations thereof, the bantam-weight is ink jet technology and the fly-weight, content to fight for market niches, is the thermal printer.

But these positions have resulted more from the number of contenders in the market than the real relative strengths. He who shouts loudest gets heard more and in this case it's certainly the combined voices of the laser-printer manufacturers and suppliers that are being heard almost to the exclusion of the other two.

Lasers have got to this leading position for two reasons: falling prices have brought the technology within reach of a far wider sector of the PC-user market; and the conception and meteoric growth of the desktop publishing market have created what many see as a completely new market to sell into. Consequently, few companies have been able to resist the laser-printer bandwagon and each new market entrant has contributed to the escalating hype.

Admittedly these developments are a genuine windfall to those users that really do need what laser printers can offer but others would be well advised to ignore the noise at least for another year, and look instead to the market underdogs.

Both ink jets and thermal printers have one attribute that lasers cannot yet touch — colour printing.

Under software control, leading ink jets can produce several thousand shades and although significantly more expensive than ink jets, thermals are highly commendable on colour quality. But the route to effective colour printing has not been easy in either case.

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chrome, create characters or graphics in a similar way to dot matrix printers but have a matrix of ink nozzles rather than pins in the print head. Like dot matrix printers, ink jets have advanced from eight nozzle to 24 heads with resultant improvement in both resolution and, in the case of colour units, far more sophisticated multi-hued output.

Not surprisingly one of the main problems in getting to this level of sophistication has been the messiness of the technology — a problem which several of the more basic models still suffer from. Liquid inks have a tendency to clog up either on the page or in the head, which needless to say detracts from both colour quality and reliability.

Techniques used to try and overcome the problem have included vapour inks which are sprayed rather than squirted onto the page and hot inks which are solid while in the printer but melt in the actual act of printing to re-solidify on the paper. It would be inaccurate to say that these alternatives have completely resolved the problems but reports claim that they have certainly improved both quality and reliability.

Thermal transfer printers function by way of a hot print head and a coated print ribbon. The head melts the coating from the ribbon onto the printed page. In the case of colour printing the ribbon is divided into several, usually four, colours and the head has to make several passes in order to get a touch at each colour. The system is similar to colour dot matrix printers but, without an actual impact on the page, thermal printer output tends to look far less battered. As the accompanying APC Printer Survey shows however, thermal printers are not for the financially weak in pocket to either buy or maintain.

Another problem with earlier ink jet and thermal printers that still cannot be dismissed as fully overcome is that standard office paper won't always do. While some manufacturers do seem to have got over this, others still recommend special paper is used.

With colour lasers still said to be two years away, the obvious application for both ink jets and thermals is in business graphics. As both still produce an obviously dot-based output rather than continuous lines, neither is really competitive with plotters in the CAD market which ties them both to business charting and presentations.

To enhance their suitability to this market most models can print on overhead projector film and can combine text and graphics on a single page.

Unlike most other sectors of the printer market, these two areas are not

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crammed with competitors but there is still a wide array of prices. This means there is relatively little direct duplication from model to model. Most are fairly specifically targeted and it will certainly help to know exactly what is needed in order to find the right one.

Bowing to market pressure, the rest of this copy is dedicated to lasers, light-emitting diode-based printers, liquid crystal display-based printers, ion deposition printers and other electrochemical page printers, all of which are close enough in features and benefits to be crudely rounded-up into the final category.

For the earnest purchaser, the differences between the technologies stem from the way that the image of the page is etched onto the print drum and transferred to paper. Some technologies etch the characters and others etch the white space around the characters but the exact benefits of the different methods are difficult to assess as contradictory

claims are often made by different manufacturers.

An encouraging fact however, is that there is nowhere near as many technologies as there are printers on the market. This is because most suppliers don't manufacture their own 'innards' but buy them under an OEM deal from a stock of about a dozen core print engines. The Apple LaserWriter and HP LaserJet are, for example, both based on the Canon LBP-CX print engines.

Unfortunately this doesn't mean that the LaserWriter and LaserJet both offer the same features. On top of the basic engine, suppliers have a wide choice of extras that they can bundle into the overall unit to either optimise general performance or steer the printer towards some specific market sector.

Apple's LaserWriter has, for example, been aimed singlemindedly at the desktop-publishing field and is consequently padded out with generous add-ins in order to cope with page layouts

that include both multiple fonts and bit-mapped graphics.

Among the add-ins is a 12MHz 68000 processor chip which houses Adobe's PostScript page-description language — the program that interprets the layout of the page from the information sent by the host PC to a format that means something to the printer.

Since lasers are widely promoted as going hand-in-hand with desktop publishing, it is surprising that so few machines have followed Apple's lead with PostScript or for that matter any other description language.

Where a processor is built into the printer it will invariably be housed on an add-in card. This will also have an amount of RAM and/or ROM, where typefaces can be stored either as resident features (in ROM) or as optional extras downloaded from either font cartridges or disk (in RAM). The image of the complete page is also stored in RAM before printing. The make-up of

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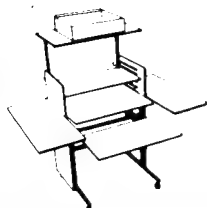
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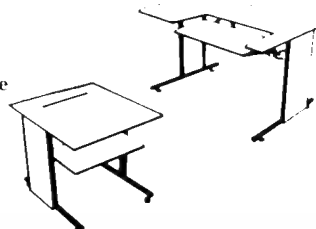
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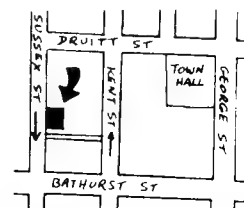
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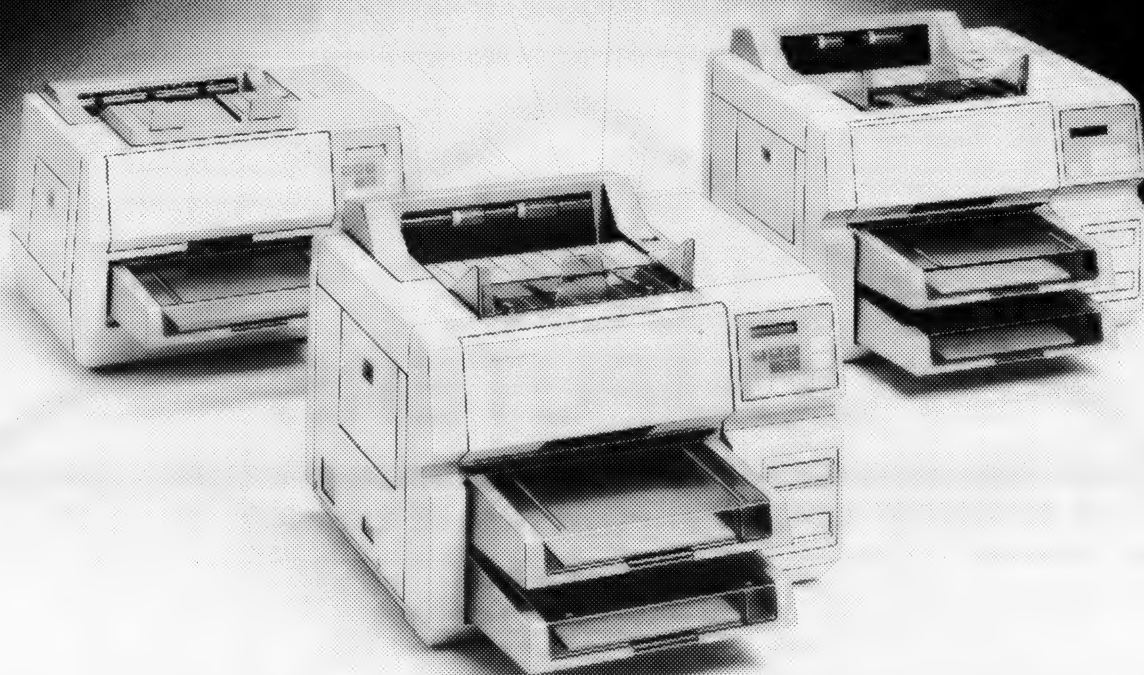
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the add-in board is consequently the major determinant of printing performance.

Also bundled by the manufacturer may be communications facilities that allow the printer to be used as a central resource in a network and this then demands that there is enough memory available for a buffer to store jobs for printing without clogging up the rest of the attached network.

An area in which laser printers are often lacking is in paper-handling facilities. This is particularly true if the printer is used as a shared resource by a number of users, some of whom may

use it remotely. Most, but not all printers, come with standard input and output trays of at least 50 sheets. For a shared printer however, a hopper of at least 1500 sheets would be more appropriate. It would also help to be able to select from different hoppers remotely, ie, either A4 or A3 paper, but this, at the moment, is pie in the sky with most machines. Many don't support anything other than A4 and American sizes.

With the number of grandiose claims that are made for laser printers it is easy to be critical. They are fast, but not usually as fast as the manufacturer claims — as it will usually choose to talk

about time per copy rather than time per original page; and they are flexible although often it will cost dearly in optional extras to reach the flexibility (eg, font and graphics handling) claimed in the supplier's literature.

The standard resolution of 300 dots per inch also guarantees higher-quality output than most dot-matrix printers, but to the discerning eye the impeccable quality of daisywheel printout is worth staying true to if text without different fonts, graphics and letters with varying point sizes are your primary concern.

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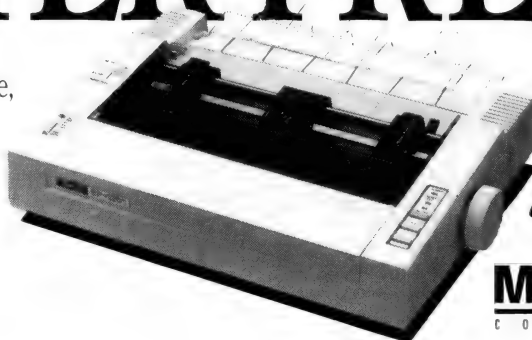
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Programs will be rated primarily on the degree of compression they achieve, but with very minor consideration to speed. The programs will be required to operate on a variety of data files, including databases, text files, spreadsheets, source code and executables.

Entrants may utilise absolutely any approach they like, no matter how standard or off-beat.

Source code must be supplied, and our evaluation panel will rigorously test each entry.

A broad description of the approach employed should also be provided. Any program which does not decompress the data back into its original form will automatically be disqualified, regardless of its speed or degree of compression attained.

Fig 1 shows the conceptual simplicity

of the contest. Your mission (should you choose to accept it), is to construct the compression and decompression programs, each one reading its input from a file and writing its output back to another file. There is only one prize, first prize, and it's \$30,000.

This could prove to be the easiest money you've ever made. Even if you take a week off and dedicate the time to this project, your cash return will equate to \$750 per hour — almost as good as Robert Holmes a Court.

Many of the best compression methods are simply elegant, and so the amount of code you end up writing may not be very large. Many technical libraries contain quite old books on forgotten compression algorithms developed in the fifties and sixties, then abandoned due to their high CPU overheads, never to be used again. These forgotten algorithms are appropriate for use in this contest, as we're mainly after high compression rates, not speed.

Similarly, many other branches of science and mathematics have developed well established disciplines which have implications to data compression. You may well find that some obscure, or well known, branch of statistics leads to a new technique for compression.

Alternatively, you may discover that a number of very well known compression techniques, when applied in a cascade of the correct sequence, yields uncommonly high degrees of compaction. Remember, the time taken to compress the files is of little significance, and if program A provides twice the compression of program B, but takes twice as long to run, then program A will win.

We're leaving you lots of time to ap-

proach this properly. Entries may be received up until January 4, 1988. We will be running articles in the next two issues of *APC* providing insights to some of the approaches to compression, introducing more sophisticated techniques as we go. You can also assume that if your creation cannot exceed the performance of the examples we present, then you'll need to apply a bit more spit and polish.

Entry requirements

To enter, all you must do is supply a diskette containing two programs, one to compress a file, and one to decompress it. Each program should prompt for the input and output file names. The diskette must be clearly marked with your name and address.

An accompanying note should briefly describe the approach you have taken, naming any recognised algorithms you have employed.

All programs must be able to run in one of the following environments:

- Under Microsoft MS-DOS version 2.0 or higher, on IBM compatible hardware. Entries must be supplied on 5^{1/4}in MS-DOS format DSDD diskettes, and should be independent of co-processors or other hardware assistance.
- On either a Macintosh Plus or Macintosh SE.

In both situations, entries must be accompanied by a suitable SSA package should its return be desired.

If you do not have immediate access to a Microsoft MS-DOS-based system or a Macintosh, we recommend you develop your software on whatever machine you have, whether it be a Commodore 64 or a CDC Cyber. You can then port your finished solution to

an MS-DOS machine or Macintosh before sending it in and planning what to do with the thirty big ones.

All programs received will be evaluated on the same machine, utilising a freshly formatted RAM disk to eliminate any discrimination due to disk fragmentation between runs. Each program will be measured on a variety of file types, and a weighted average will be calculated. The evaluation environment will be carefully controlled to ... er, well.... it'll be carefully controlled.

The entries may be developed in any language or languages you choose, as long as it's a Microsoft language. Microsoft GW-Basic interpretive programs are perfectly acceptable, as are 'C', assembler and Pascal. However, both source code and executable (compiled) forms should be provided. We're interested in how you've done it, but don't want to go searching for other software required to run it. Remember that speed is not of primary importance, but if two programs achieve very similar compression ratios, then the faster program will win.

Details of the index used are contained in the box at the end of this article.

Compression techniques

All compression techniques are based around the elimination of redundant information.

For example, consider a single bit which may be either 1 or 0. This information takes one bit to store, and contains absolutely no redundancy. There is no more compact way of expressing the fact of 1 or 0, other than utilising a single binary digit to do so.

However, consider a string of bits, for example, 1111111000011111. This information has taken 16 bits to store in its present form. Looking at the data, we see that it contains long 'runs' of bits all the same value. Therefore, rather than store the contents of each bit, the information could be presented more compactly by only storing the transitions from a run of ones to a run of zeros. For example, seven ones, four zeros, five ones. Indeed, utilising perfect knowledge of the data to be encoded, we do not even have to remember whether a given run was of ones or zeros, we can deduce that it is different to the preceding run, and make the assumption that all data streams begin with a one. If it turns out that the first run is not of ones, then we simply store an initial run length of zero.

Using this approach, the above data

could be encoded to just 7,4,5. Or, assuming three bits are used for each run length, 111100101. The original 16 bits has now been reduced to nine bits. As you can see, the coded form still consists of runs, but smaller runs. In other words, it still has a degree of redundancy and is probably eligible for further compression.

This technique is known as run length encoding, and can be applied to either individual bits or streams of bytes. Most good terminal protocols utilise run length encoding in a transparent manner to reduce line loading, as the average screen full of data contains many runs of blanks, minus signs and asterisks.

The difficulty in run length encoding is that sometimes there will be no suitable runs, for example, 1010101010 or '*-*-*'. These streams may still be suitable for a form of run length encoding, simply by recognising that the unit being repeated is not a single byte or single character, but a sequence. Thus the bit stream could be encoded as five groups of 10.

Run length encoding initially seems to be the answer to all the worlds problems, not to mention your new car. However, a number of problems emerge as you get closer to the problem.

The first challenge is that some portions of the data stream may not be at all suitable for run length encoding, and some form of marker must be created to indicate when run length encoding has been employed and when it has not. This marker must be totally unambiguous, in other words, there must be some way of not confusing it with bona fide data. Some approaches to this problem include utilising a run to indicate that run length encoding is about to be used. The decompression software sees the unencoded run, and knows that run length coding is about to be employed.

The other difficulty lies in choosing an appropriate size for the expression of the length of each run. In the above example, we utilised three bits to represent each run length, allowing for a maximum possible run of seven bits. This approach would suffer if a run of more than seven bits were encountered in the input file. Again, various approaches exist to circumvent the problem, including one whereby a run of 10 bits would be encoded as a run of seven bits, followed by a run of zero complemented bits, followed by another run of three.

Choosing a large number of bits to

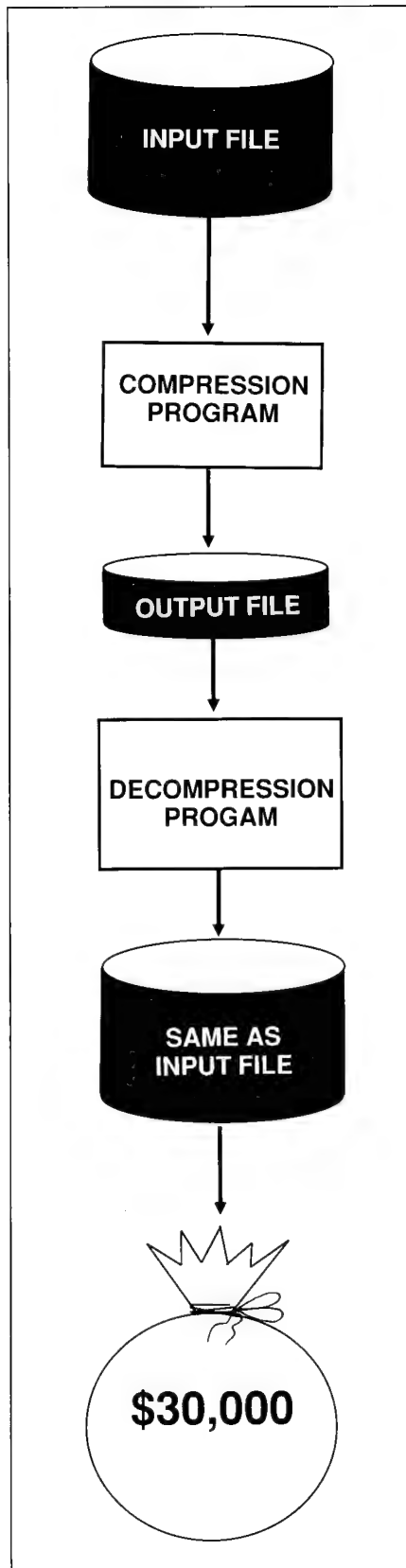


Fig 1 Conceptual structure of the contest

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represent the run length imposes an obvious overhead, as small runs then become very inefficient to encode. On the other hand, if a small number of bits is chosen, then the massive benefits which normally result from a large run will be wasted away. Some approaches involve using a variable number of bits to represent the length of each run. This technique works well, but introduces its own overhead in somehow representing the end of each number. Bit stuffing is sometimes used to achieve this.

The compressed data stream does not have to be a simple structure. For example, a 'map' could be included so that the decompression software knows what techniques have been employed in various regions of the compressed file. For example, a map of 200-0, 800-3, 30-8 could mean that the first 200 bytes are completely unencoded, the next 800 bytes utilise run length encoding bit a length size of three bits, the next 30 bytes use eight bit quantities to represent the length of each run, and then expect to find another map.

Under-utilised domains

Sometimes very simple methods provide quite good compression ratios, or at least a good head start.

Take, for example, simple text files.

The ASCII character set contains about 96 displayable characters, including upper and lower case forms of each letter. Computers use eight bits to store each character, when really only seven bits are required to store 96 different values. Simply by eliminating the eighth bit and repacking the characters, a compression factor of 12.5% may be achieved.

A factor of 12.5% may not seem very impressive, and eliminating the eighth bit may not be at all suitable for WordStar document files, but when combined with other techniques, the head start gained through eliminating an under-utilised domain of each byte can prove significant.

This is even more true for upper case streams of text, which only requires six bits to represent all possible characters. Utilising six bits instead of eight produces an up-front compression factor of 25%.

Again, sneaky techniques can be used to make these techniques viable even when they seem not to be appropriate. For example, if text is primarily all in the same case, with relatively few characters in the other case, then a map or switching symbol could be utilised to indicate case changes. Even more sneaky is a technique which can be applied to text files, which are predominantly lower case. Text files contain a few upper case characters,

but their placement is according to rules. One simple rule is that the first alphabetic character following a full stop will be in upper case. If the compression system knows that the file contains normal text, then it can automatically recapitalise the first word in each sentence without spending any file space. Less space-efficient means could then be utilised to identify capitalisation which is not according to the standard rules.

Of course, one must carefully consider the effort expended and the return received. A saving of 25% for simple character packing sounds like good value, but saving an additional 1% for complex upper case prediction is probably not.

Alternatively, rather than eliminate an underutilised portion of the domain, the domain can be preserved and simply redeployed in a more useful fashion. The unused eighth bit, for example, could be utilised to indicate that a space follows. Setting the bit to a one means insert a space after this character, and leaving it at zero means do not insert a space. Where the eighth bit genuinely does form part of the data, then this exception could be dealt with by inserting a space into the compressed file. Since the decompression routine knows that it should see absolutely no spaces in the compressed file, then it can reliably assume that the presence of a space indicates that the preceding byte with its eighth bit set is not a command to insert a space, but a bona fide eighth bit of data. If the average length of a word in normal text is five characters followed by a space, then this approach will yield an immediate saving of 16%.

This approach results in the eighth bit being usefully engaged at the end of each word, that is, only about one fifth of the time. The technique could then be combined with other techniques to indicate capitalisation, thereby reducing the character size from eight bits to seven. While it may seem that using the one bit to indicate special effects both at the beginning and end of the word is ambiguous, particularly when the word delimiters (the spaces) have been removed, it really is not. All you have to do is assume that the text file commences with the beginning of a word and not the end of a word — a reasonable assumption — and then the whole process stays in synch for the rest of the file.

Machine code files and binary data files are rarely suitable candidates for this type of compression, but do offer their own opportunities.

Entry checklist

1. Two programs: COMPRESS and DECOMPRESS, each prompting for input and output file names.

2. Programs to be supplied on either MS-DOS 5^{1/4}in DSDD disks or Macintosh Plus or SE disks, clearly labelled and with a suitable SSA should return be required. No responsibility will be accepted should the disk or accompanying documentation be lost or damaged.

3. Both source code and an executable form to be supplied.

4. Description of your approach to be included, detailing any 'known' algorithms you have employed.

5. Only Microsoft language or languages may be utilised.

6. Must be independent of any hardware assistance.

7. Decompressed file must be identical to original input file.

8. Entries to be evaluated on the basis of average weighted compression ratios achieved. Speed is of minor importance.

9. Entry closes at 5pm on January 4, 1988. Entries must arrive at either 47 Glenhantly Road, Elwood Vic 3184 or 124 Castlereagh Street, Sydney 2000 addressed to 'Microsoft's Data Compression Competition' by this time in order to be eligible for inclusion in the competition.

10. Employees of Computer Publications may not enter.

11. Any entry which does not satisfy the entry requirements may be disqualified by the evaluation panel.

12. The winner will be announced in the February 1988 issue of APC, and will receive a cheque for \$30,000 by February 10, 1988.

13. Microsoft's Data Compression Competition is open only to Australian residents. Entry by Computer Publications' employees and their relatives is prohibited.

14. The judges decision is final. No correspondence will be entered into in relation to the selection of the winner.

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C compilers

Prices of compilers have plummeted ever since Borland set a realistic precedent with its launch of Turbo Pascal. With the increasing number of C compilers now on the market, prices are falling further. Nick Walker looks at two inexpensive versions against Borland's Turbo C.

Prior to Borland's launch of Turbo Pascal in 1983, compilers for the PC and compatibles cost at least \$1000 and were about as friendly as a wild boar in a pigsty. Since then the market for budget-priced compilers has rocketed, and an increasing number are now offering a 'Borland-like' integrated environment. Particularly numerous are C compilers, probably because C has rapidly become the favourite language among hackers, and hackers as a rule don't have vast amounts of money to spend.

This proliferation of C compilers has given Borland's own version of C, Turbo C, more direct competition than any other Borland language. In this review, I've taken Turbo C and compared it with two of its better rivals — Mix C and Zorland C.

Mix C

Mix C from Mix Software was one of the earliest of the budget-priced Cs, and has been available in the US for some time. Now, courtesy of Tech Flow, it is available in Australia.

Overview

Three components are required to turn C source code into an executable program: an editor to create the source code; a compiler to reduce the code into a machine-understandable form (object code); and a linker to collect all the relevant object code from other sources such as libraries, and from these create an executable program.

Mix C includes a compiler and a linker but no editor, but any editor capable of producing an ASCII file (all editors in use today, in fact) can be used. Mix Software does produce a program editor at extra cost, and it was this which I used for the review.

The Mix 'Editor' is a general-purpose editor tailored with features which aid the creation of programs, and like many editors and word processors is fully configurable: its initial WordStar-like configuration can be mapped onto any key combination you wish to use.

Because of its common features it isn't necessary to go into too much detail about the Mix Editor, but the following is a description of some of its more appealing features.

Unusually, for a micro-based program

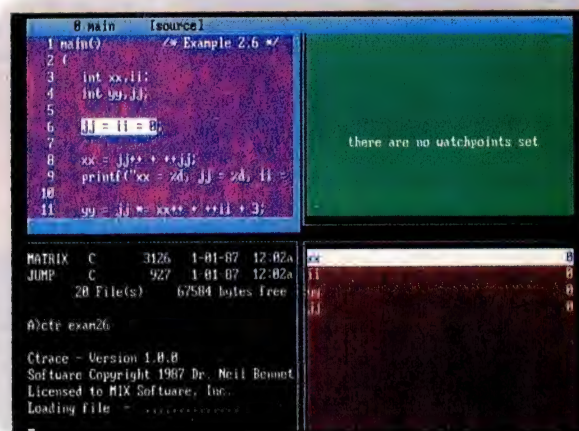
```
/* char converts to int */
c1 = 'c';
i1 = c1 - 'a' + 'A';
c3 = i1; /* truncate to character */
printf("c1 = %c, i1 = %d, c3 = %c\n", c1, i1, c3);
i1 = 321;
c2 = i1; /* convert integer to char */
c3 = i1 + 1; /* truncates value */
printf("i1 = %d, c2 = %c, c3 = %c\n",
       i1, c2, c3);

/* automatic conversion from int to float */
f1 = 200; /* converted to float */
f2 = 350 * f1; /* 350 converted to float */
/* 7 converted to float - result truncated */
i3 = 3.4 * 7;
/* 350 converted to float - result truncated */

Mix C - Version 2.5.0
(C) Copyright 1985, 1986 by Mix Software

main
No errors detected

(Press any key to continue)...
```



Used in conjunction with an editor macro, Mix C offers a crude but effective integrated environment. This is one of the many excellent tutorial programs

Ctrace is an excellent debugger for Mix C only. It maintains six windows of debugging information, of which any four can be onscreen simultaneously

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COMPETITION

Repetitious data

A common and effective form of compression relies on the fact that most information consists of a set of repeated symbols and a set of non-repeated or rarely repeated symbols.

For example, in this article, the words 'in', 'and', 'or', 'are' and 'compression' feature regularly. If these words are replaced with markers of a smaller length, then significant savings can be achieved.

The common words can either be identified by an individual symbol which is unlikely to appear in the data stream, such as the non-displayable ASCII characters (which imposes a limit on the number of words which can be encoded) or through a single symbol followed by a word identifier as a subfield. For example, the symbol '*' could be used as a marker, and '*1' could stand for the word 'compression'.

Where a true asterisk is required, this could be represented by two asterisks in succession, much the same way compilers recognise a quote enclosed in a quoted string. That is, the character '*' would be encoded as '**', or two asterisks in the input file would be output as four asterisks.

This implies an overhead when the marker itself is encountered in the input file, but a suitable choice for the marker can minimise the overhead suffered. Some approaches even involve determining a suitable marker depending on the data encountered in the file, and outputting the chosen marker as the first character in the compressed file. The decompressor then takes whatever character appears first and utilises that as the marker in its decompression strategy.

This approach is particularly successful when used on program source files, as any given language consists of keywords which appear with great regularity throughout the source. In Pascal, the words 'BEGIN', 'END', 'INTEGER', 'PROCEDURE' and so on would produce very effective compression. Additionally, user defined variable names will prove quite common and may be good candidates for compression.

It is even possible to utilise some knowledge about the syntax rules of the language to compress the source even further, although the system would have to be able to deal with exceptions when the source is syntactically incorrect.

The key point about this form of compression is to consider local effects within the data stream. A text file may

commence with one set of very commonly used words, and then switch to another set of commonly used words after a few pages. If the system is not adaptive, then it will miss the opportunity to encode the second set of common words. Many systems monitor their own performance as the compression proceeds, both in terms of overall compression and the compression achieved over the last thousand bytes or so. If the recent performance starts to suffer, then it may employ a different technique or back up the file and try to determine a new set of common words.

These techniques, even in the simplest form, can yield up to 50% compression.

And more

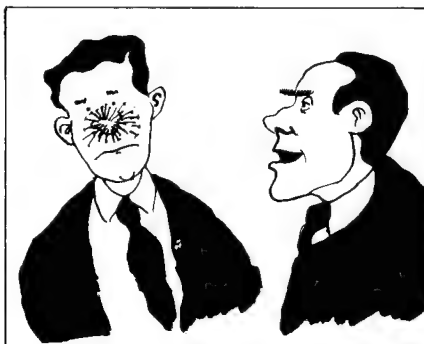
There are so many possibly compression techniques which may be combined together that the possibilities are virtually limitless.

The main point to remember is that the process must be totally transparent; that is, the technique should not place any restrictions on what data may be encoded. A strategy designed to compress text should not fail if it suddenly encounters a non-displayable character, such as hex FF. In other words, the technique must be able to deal with exceptions, and although the exceptions may not be compressed as efficiently, it should never lose data just because it received a character it did not expect.

While it is acceptable in the compression of audio or visual information to lose small amounts of data, it is not acceptable in the compression of digital information.

We'll be presenting some other ideas for compression next month. But in the mean time, get coding and start paying more attention to new car advertisements.

END



'Ah, I see the 40-pin printer has broken again.'

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MS1045 QUBECALC: Advanced spreadsheet for heavy users. tru three dimensional spreadsheet with upto 262,144 cells! Very Powerful.

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editor, the Mix Editor provides a macro command language which allows you to combine existing commands into commonly used combinations. For example, one of the pre-defined macros is BOX: typing 'Esc BOX' prompts you for height and width, and you then use the IBM graphics character to draw a box — a feature I frequently use to highlight comments within a program.

Other useful features include: no restriction on file length; the ability to execute DOS commands or run a program from within the editor; and split-screen operation. A macro called 'CC' allows you to run the Mix C compiler over the text in the editor's memory. When CC is used in conjunction with the split-screen facility, you can display the C source code in one window and compile errors in another. This allows you to display and correct multiple errors — unlike some integrated environments which stop at the first reported error. The linker and the final program can also be run from within the editor but not from menus such as those found in Zorland C or Borland C.

Mix C is a command-like driven compiler. Unless a '/i' switch is given as an argument, the compiler will list the whole C listing — plus error messages — to the screen, which is fairly meaningless unless you have a degree in speed reading. Mix C is also a single-pass compiler, although like most C compilers it has one very fast pre-processing pass which establishes all external references. Further switches control stack size and destination of the object code.

The IBM PC and its compatibles have what is called a 'segmented' architecture: that is, the whole of the memory area is divided into 64k segments. Compilers which produce code for this architecture have a choice of 'memory models' for the final program (code and data in the same 64k segment; code in one segment, data in another; or code in many segments, data in many segments). Mix C produces object code for one, and *only* one, memory model — the large one (code in many segments, data in many segments), so it is rather inefficient for programs with less than 64k of object code.

The Mix C compiler accepts the full C language as specified in *Kernighan & Richie (K&B)* but with one exception — you cannot use an array element address as an initialiser (a silly thing to do, anyway). Also, the following extensions have been added: support for the enumerated data type (an integer that will only take specified named values); structures can be assigned, passed by value to functions, and functions may return structures; locally declared arrays and structures can be initialised; and there are compiler options which allow nested comments, the passing of actual char and float values to a function, and automatic initialisation of local variables to zero.

Mix Software divides the library functions of Mix C into four distinct groups — standard, non-standard, DOS and BIOS. Library header files may contain functions from each group — for example, the 'miscellaneous' library includes: a non-standard random num-

ber generator, 'drand'; the C-standard 'exit', to exit a program; 'getseg' from DOS, to return the current code segment; and the BIOS call, 'sound', to drive the IBM's speaker. Although the functions are listed according to which files they are in, there is no mention of the actual file names in the Mix C manual. Consequently, you have to snoop around before '#include'ing a library file.

The usefulness of any compiler is defined by its system-specific functions. Mix C is particularly well-endowed with numerous pre-defined BIOS calls, DOS functions and non-standard functions as well as all the standard C functions. For the 'real' hackers, there is a general-purpose BIOS call which gives full access to the IBM ROM.

The Mix C linker is an unusual beast in that it doesn't link .OBJ files — the standard files of practically every other compiler and assembler on the market. This means that you can't link your existing routines from other languages. Also, the .MIX files which are created by the Mix C compiler are not linkable with any of the standard linkers.

Most professional C programmers use different manufacturers' compilers and linkers in their own customised setups, but this is not possible with Mix C.

The linker can be run as a command-line program: a number of switches can define options to the linker, to control stack size, for example. Unless the '/i' option is included, the linker will produce an executable file that requires the file 'RUNTIME.OVY' in order to run; this gives you very small object files but less portability. Alternatively, for those people who like fine control over the linking process, simply typing 'LINKER' with no arguments will take you to a linker menu screen. All stages of the linker (load file, find functions, run, build, and so on) can be controlled manually.

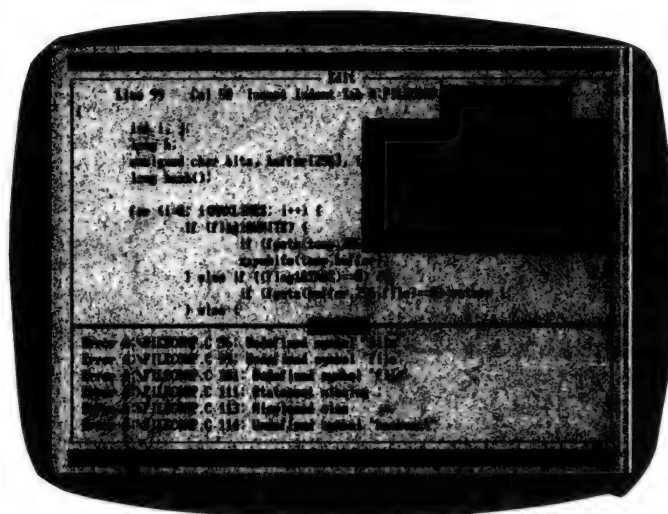
Although Mix C does include some conditionally compiled diagnostics to aid debugging, an independent debugger is really needed to track down the more elusive bugs. I was also provided with Ctrace (a bolt-on extra for Mix C which was written here in Australia by Dr Neil Bennet) and specifying '/t' after the 'compile' and 'link' commands will allow it to do its job.

The program 'CTR' will run Ctrace and it requires your executable file as an argument. Ctrace then maintains six windows of information: position in source code; program output; variables and their values; a 'watch' window that allows you to define a particular set of

Benchmarks

	Mix	Zorland C	Turbo C
Intmath	0.075	0.058	0.045
(File size bytes)	(22561)	(9600)	(5484)
Realmath	5.7	4.1	3.7
(File size bytes)	(22824)	(9744)	(19288)
Triglog	101.9	68.7	26.1
(File size bytes)	(22735)	(20244)	(19356)
Textscrn	153.1	64.1	72.3
(File size bytes)	(22672)	(9584)	(5460)
Grafscrn	12.8	-	-
(File size bytes)	(23271)	-	-
Store (hard disk)	5.3	4.7	4.6
(floppy disk)	14.1	13.0	12.8
(File size bytes)	(24221)	(19871)	(19323)
Hack compiling	48mins 12secs	78mins 35secs	45mins 49secs
Hack linking	25mins 21secs	32mins 9secs	15mins 33secs
File size	(312823)	(275261)	(249888)
	(295661)	(after running 'Shrink')	

All Benchmarks were run on an Amstrad PC with a MiniScribe 30Mbyte h/disk



The Turbo C version of Borland's integrated environment is the best yet, with 80-column default windows and the most comprehensive control menus



The Turbo C pull-down menus, plus the reporting of multiple source errors. You can set a maximum limit on the number of errors reported

variables, and a course of action should they reach certain values; a 'symbols' window which shows the address of functions and variables; and a 'memory map' window. Programs can be executed single-step, trace speed or at full speed. Whenever a breakpoint occurs or a watch variable meets its value, a pop-up window appears which specifies exactly what has occurred.

Ctrace includes an animated trace feature which shows you the flow of execution; not just line by line, but statement by statement. Watching the red cursor follow every movement of the program almost made me want to sing along! What a shame that it's limited to Mix C programs.

Ctrace is by far the most delightful debugger I've come across — I actually found myself *enjoying* debugging!

Installation

Mix C requires a 128k MS-DOS computer with one disk drive, but I would advise 256k and two disk drives as working with less can be limiting.

Mix C is the only C compiler I know of that is usable on a floppies-only machine. Unusually, it will run on a generic MS-DOS machine although it obviously won't be able to use any of the IBM BIOS calls. Mix Software also produces a CP/M version of the compiler which is functionally very similar to the one featured here and requires a 55k, CP/M-80, two-drive machine. For floppies-only machines the files are organised correctly, so it's just a matter of copying the disk and getting started. Similarly, installation on a hard disk simply involves

copying the files to a suitable directory.

Mix C is not copy-protected and has a simple 'treat me like a book' type copyright notice. Programs created under Mix C do not require a run-time licence and can be freely distributed.

In use

As a test of compilation speed, linker speed, object code size, execution speed and K&R compatibility, I used the source code of a public domain game called Hack. This consists of approximately 60 C source files and header files with a total source code size of around 700k. Hack was originally written for Microsoft C which, with Lattice C, is one of the traditional heavy-weight compilers. (Incidentally, the authors of Hack claim that they haven't overstepped the boundaries of K&R.) Under Microsoft C, Hack compiles down to an executable file of 255k. The program embraces a wide range of features including real and transcendental arithmetic, file handling, data structures and even graphics via calls to the BIOS.

The idea behind this 'Hack test' was to see which, if any, problems arose when using the compilers reviewed here on a 'real' application. All three compilers were run from the command line and, where possible, used the 'MAKE' system of showing dependencies and grouping multi-source file compilations.

Mix C performed extremely well, with the Hack Test taking approximately three hours to get the application up and running, including: the creation of a suitable batch file, sorting out the few er-

rors that occurred, and linking the whole system. (The test times for all three compilers can be seen in the box on the previous page.)

Mix C found two errors in the Hack source — and, of course, over such a large application, found them many times. These errors were nested comments and a possible unintentional assignment (using 'if (a=b)' rather than 'if (a==b)'). Both these errors can, in theory, be converted to warnings with the setting of a compiler switch. However, with the switch set, Mix C still objected to some of the nested comments. I eventually solved the problem by putting an extra pair of comment delimiters around the offending code.

I also ran the *Australian Personal Computer Benchmarks* on all three compilers (see *APC* November 1986). In many respects Mix C came off worse: its execution times were the slowest in all tests. Despite the use of the 'shrink' utility, the executable file size was almost always the biggest, although this was due to the large memory model used and would not be so noticeable on large programs.

On the plus side, though, Mix C is a very fast compiler. If you switch off the listing to the screen it's almost a match for Turbo C, because Mix C operates entirely within memory and creates no intermediate files on disk.

Expansion

The three utilities supplied with Mix C are 'shrink' (mentioned above), 'speedup' and 'convert'. Shrink takes an object file as input and attempts to

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optimise it for object code size; the typical space saving is 10-25 per cent. Speedup operates in a similar manner but optimises for speed. (The effectiveness of these routines can be gauged from the test results box.) Convert takes a Mix C-format object code file and turns it into ASCII.

No extra libraries are available with Mix C, although it is compatible enough to run most of the commercial C libraries.

Documentation

Mix C comes with a 434-page manual in the usual 'budget paperback' form pioneered by Borland. Approximately 150 pages are dedicated to one of the most complete C tutorials I've seen bundled with a compiler.

The rest of the manual consists of a fairly standard C reference section and a comprehensive description of the library functions.

Price

Mix C, Ctrace and the split-screen editor cost \$49 each, alternatively, \$89 will purchase all three programs (Mix Works) plus a utility to link assembly code, and an examples disk.

Zorland C

'No — I want a *real* compiler.' I don't know how many times I have heard

that remark after advising someone to buy Zorland C. Despite its \$99.99 price tag, Zorland C is a true compiler and in some ways more at home alongside the \$500-plus compilers such as those produced by Lattice or Microsoft, than the two it is pitted against here.

Overview

Zorland C, includes an editor and a compiler but no linker. However, any standard linker can be used, such as the one bundled with MS-DOS. Zorland does provide a linker at additional cost, either as part of the company's 'Developer's Upgrade' or separately, and it was this linker which I used during this review.

Zorland C Version 1.0 had a primitive WordStar-like editor. Its successor, Version 2.0, has retained the original dozen or so WordStar commands and has added to them, thereby upgrading it into a full-function text editor. The additional commands are available via two-line horizontal Lotus 1-2-3 style menus rather than the more usual pull-down style menus, and can be accessed by 'Alt' key combinations.

Everything you would expect from a text editor is here in the new Zorland C but, for some reason, it still feels a little crude. Perhaps it's the monochrome screen or the speed of operation — very slow with big files.

The menu options include 'compile':

the system is configured so that compile calls the linker being used and runs the program if no errors are detected. If an error *is* detected, the compiler is stopped and the cursor is placed near the error. If the error is a warning, pressing Enter will continue the compilation; otherwise, the error must be corrected and the compiler invoked again.

One word of warning about using the Zorland integrated environment — it does *not* like the presence of any memory-resident programs. SideKick, PC Outline, DeskSet and even Mode would cause it to crash.

Zorland C is a K&R implementation, and also features the complete ANSI and Unix System V extensions. Additional features include: the ability to define constant and volatile types (a constant type never changes under any circumstances, and is typically used for data in ROM, whereas a volatile type can change even if the program doesn't, and is exclusively used for memory-mapped devices such as ports); argument checking, for functions; enumerated data types; and void types, for functions which don't return a value.

Zorland C is a two-pass compiler arranged as two separate programs to perform each pass. The \$99.99 version of Zorland C is limited to small systems (up to 64k executable code, 64k data), but an additional \$69.99 will buy a Developer's Upgrade which provides a further three memory models to exploit the full addressing space of the IBM PC architecture.

Zorland C implements a full range of file-handling, arithmetic and input/output libraries, both standard C format and MS-DOS specific, and the complete library is 98 per cent compatible with the more expensive Lattice C libraries. The Developer's Upgrade contains the full source code for these libraries and means that you can create your own customised libraries. While the Zorland libraries do include the necessary DOS and BIOS calls, these are limited to low-level calls — for example, there are no graphics mode calls. This can be a little off-putting for beginners, as consequently there is no easy way to access the more interesting 'goodies' of the machine.

As I have already explained, no linker is supplied as standard with Zorland C but the program's object code files conform to the MS-DOS standard. This means that the linker supplied with MS-DOS operates fine; it also means that the object code from other compilers and assemblers can be linked in.

Specifications

	Mix C	Zorland C	Turbo C
Passes (compiler)	1	2	1
Creates .OBJ files	No	Yes	Yes
Memory models	1	4 ₁	6
8087/80287 support	No	Yes	Yes
ROM code generation	No	Yes	No
Integrated development environment	Yes	Yes	Yes
Kernighan & Richie standard	Yes	Yes	Yes
ANSI extensions	Yes	Yes	Yes
MAKE utility	No	Yes	Yes
Command-line operation	Yes	Yes	Yes
Approx number of lines per second being compiled ₂	3500	1800	6500
Library source code	No	Yes ₁	No ₃
Size optimisation	No	Yes	No
Speed optimisation	Yes	No ₄	Yes
Number of library functions	190	210	390
Graphics functions	Yes	No	No
Number of compiler error messages	80	105	130
8087/80287 co-processor support	No	Yes	Yes
80286 protected mode code generation	No	No	Yes

1 Only with the Developer's Upgrade or the professional pack

2 With a meaningless large single file containing no include files

3 Available at an extra cost

4 An optional optimiser is available from Zorland at extra cost

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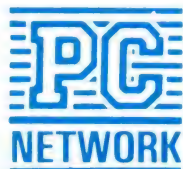
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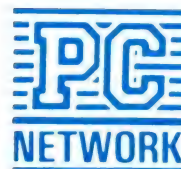
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SCREENTEST

The cut-down MS-DOS shipped with the Amstrad PC1512 does not include a linker. For this reason, Zorland has produced its own much-improved version of the 'LINK' programming facility which is roughly twice as fast as Microsoft's and includes a simple 'librarian' to help create your own libraries.

The one component missing from the Zorland collection, even at extra cost, is a debugger. Unfortunately, the recommended conditionally compiled commands are not really adequate for any serious debugging. If only Mix C's Ctrace would work with other compilers, things wouldn't be so bad, but as it is you could end up paying more for a decent debugger than for a complete, upgraded Zorland C.

Installation

Zorland quotes no minimum-system configuration but, as far as I can determine, a twin-floppy 256k IBM PC or compatible is the basic system required in order to use Zorland C successfully. To get the most out of it, you really need a hard-disk system. There is no copy-protection on any Zorland product, so in-

stalling the C compiler is just a matter of copying the file over or, if you're feeling lazy, running the 'Install' program. I recommend separate directories for libraries and source code, but this means changing the path within 'CONFIG.SYS' as Zorland C doesn't really understand directories. Not unsurprisingly for a company called Zorland, the licensing agreement is a clone of Borland's aforementioned 'no-nonsense, treat me like a book' agreement. This allows you to use the program on the machine of your choice, provided it is never in use on two machines at the same time.

Programs created with Zorland C can be freely distributed.

In use

Zorland C made a valiant attempt to compile the Hack system, throwing up warnings about nested comments and then deciding that one of the nested comments was in fact an error. Zorland C doesn't include an option allowing nested comments, so I had to go through the source, 'un-nesting' wherever they occurred. This tedious process, combined with the slowest compiling time of the three programs,

meant that it took me about 5.5 hours to get the game up and running.

Interestingly, memory-resident programs wouldn't work with the Zorland version of Hack whereas they would with Borland and Mix implementations.

The execution times of Zorland C programs are fast: it consistently beat Mix C, and independent sources assure me that Zorland C produces quicker programs than either Lattice C or Microsoft C. However, with the exception of the 'Textscrn' text mode screen-handling routine, Turbo C had the upper edge.

Don't let this put you off, though — Zorland C produces fast, compact, executable programs.

Two utilities which have been borrowed from the Unix C environment, 'MAKE' and 'TOUCH', give Zorland C a very professional feel. MAKE is an automatic program maintenance facility that comes into its own on large systems spread across many source files. Rather than re-compiling the complete system, in just one source file MAKE will determine which files have changed since the last compilation, which files depend on them, and then compile just the requisite files.

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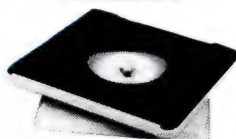
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TOUCH changes the last modified date to the current date, and so forces compilation.

An optimiser can be purchased at extra cost, and performs a third pass on the compiler code, so improving execution speed. Unfortunately, this wasn't supplied with the review package, so I am unable to comment on its effectiveness.

Expansion

There are two additional libraries for Zorland C. The BTREE/ISAM Database provides the facilities of a simple database, such as indexing. Zorland Windows gives easy controls for the creation and manipulation of ANSI character windows, and also provides a Lotus 1-2-3 menu control.

Documentation

Zorland C's accompanying literature is a 350-page manual. A rather feeble tutorial occupies the first 80 pages, but otherwise the rest of the book is adequate. The technical information for the professional C programmer is excellent, and includes a discussion of such

problems as producing ROM-able code, memory model difficulties and linking other languages.

Price

In its cut-down form Zorland C costs \$99.99, but I would recommend the power package. This includes the fast Zorland linker, C compiler and Developer's Upgrade and retails at \$220.

Zorland also sells a linker/librarian for \$69.99. The BTREE/ISAM Database sells for \$99.99 and no price was available for Zorland Windows.

Borland Turbo C

It's an interesting reflection of the state of the software market that Borland's Turbo C is the most expensive of the three compilers reviewed here. While everyone else has cut their prices to less than Borland's, Borland hasn't budged from the \$200-\$220 price bracket that established the budget PC software market. Still, why reduce the price when the product is selling so well?

Overview

Turbo C is the most complete of the three programs tested and comprises a compiler (in both integrated environment and command-line versions), an editor, a linker and a number of extra utilities, all as standard. Professional programmers will be pleased that this Borland language incorporates a command-line-driven version. The integrated environment is fine for small applications, but most larger applications are controlled by custom batch files.

The editor supplied with Turbo C is an integral part of the Borland integrated environment and can't be used in any other way. The default editor window occupies the upper two thirds of the screen and is 80 columns wide. This is an improvement over programs such as Turbo Prolog which default to a quarter-screen editing window. The bottom third of the screen is used for reporting error messages.

As with all recent Borland languages, all windows can be resized as required.

The Turbo C editor has the most complete WordStar command set of

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SCREENTEST

the three programs looked at here. It is also the most program-orientated, with such features as auto-indent and very fast handling of large files. There is no facility to customise the control commands, so if your favourite word processor happens to be WordPerfect, you're stuck with having to learn WordStar. Perhaps this lack of configurability has to do with the forthcoming Borland word processor, Sprint, which is very, very configurable.

The compiler, linker and practically all other aspects of the Turbo C system can be called into action via the pull-down menus at the top of the screen. These can be called up either by Alt and the first letter of the menu or by hitting F10. In either case, the cursor keys are used to navigate around the menus while the Return key selects the desired entry.

Turbo C is a single-pass compiler which conforms to the K&R standard. It creates standard .OBJ files which can be linked in with other object files. Borland has implemented all the ANSI extensions and, as far as I can tell, all the Unix System V extension are included, although Borland makes no mention of this.

Borland C has the richest choice of memory models, capable of producing six different memory mappings for an executable file. These models are labelled 'Tiny', 'Small', 'Medium', 'Compact', 'Large' and 'Huge'.

Turbo C has too many additional facilities over and above K&R and ANSI standards to mention here, but suffice it to say that they include nested comments and more relaxed identifier-naming conventions. Also, Turbo C is the only compiler of the three capable of producing 80286 protected mode object code for use with the full 16Mbyte address space of this processor. This will be a great asset for those people interested in upgrading to OS/2 when it becomes available.

When using the integrated environment, the Turbo C compiler reports all its errors in the lower window. It is possible to specify a certain number of errors, after which the compiler gives up and allows you to correct the errors made so far. This is particularly useful in the initial stages of program development because of the knock-on effect of certain errors in C.

One wonderful feature of the Turbo C integrated environment is the ease with which you can test individual functions and procedures. With a little effort, you can ask Turbo C to prompt you for a

procedures argument and then print the results you wish to see. This feature alone could save hours of development time.

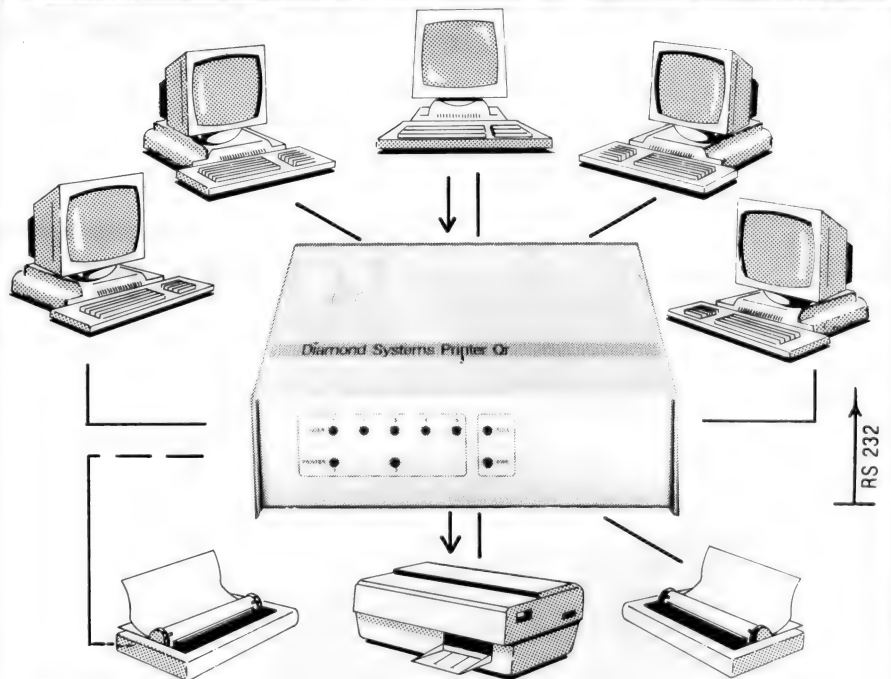
In terms of the quality of functions provided, Turbo C has the most comprehensive library of the three compilers. However, the Turbo C and Zorland C libraries share that same failing — they are both too low-level. I know that C has been likened to a high-level assembler but, nonetheless, it is very frustrating, for example, not to be able to run the APC graphics Bench-

mark, Grafscrn, because there is no 'plot' command.

The Turbo C linker, like the compiler, can be run from the integrated environment or as a command-line program. Borland describes the linker as 'lean and mean', which is fairly accurate as it's very fast, although it does lack a lot of the 'bells and whistles' of other linkers.

No debugger is included with Turbo C, although the program does have a decent collection of optional compiler directives to aid debugging.

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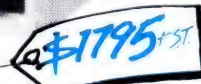
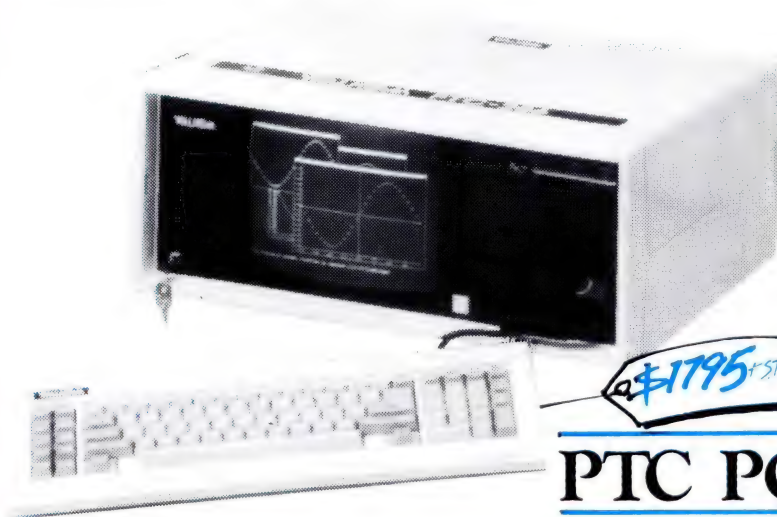
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Installation

Turbo C requires 384k or more of memory and a single floppy; any serious work requires a hard disk. For a Borland product, installation was quite complex, requiring a different kind of file from each of the four disks to be copied into different directories. No installation batch file was provided.

Turbo C is not copy-protected and has a simple licensing schedule that forbids running two copies of the program at the same time. Any programs developed under Turbo C can be freely distributed or sold.

In use

It took less than an hour to get the Hack program up and running with Turbo C, and the program compiled the Hack C source code first time without so much as a squeak. This was an impressive performance.

Turbo C also lived up to its 'Turbo' label when running the APC Benchmarks. In all tests bar one (Testscrn), the Borland product came out on top.

Expansion

Included as standard with Turbo C are the TOUCH and MAKE utilities familiar to C programmers in a Unix environment. Between them these utilities take a lot of the effort out of maintaining a large system, as they can be configured to compile only the files which have been affected by any change. I particularly like the inclusion of a 'baby' MAKE facility within the integrated environment, as this allows beginners to become familiar with the concept.

Borland usually releases a set of additional libraries for numeric work, graphics, database design, and so on, some time after the release of a language. In the case of Turbo C, the company hopes to have a collection similar to that of Turbo Pascal released by 1988.

Documentation

Over 700 pages of documentation is supplied with Turbo C in the form of two manuals, a *User Guide* and a *Reference Guide*. My only criticism is of the tutorial which is good but far too short, and the wealth of advice it contains on using Turbo C with other languages is directed only at Borland products.

Overall, though, the manuals are ex-

cellent, and cover most aspects of using Turbo C. In places, they were interesting enough to be read as guides to programming the PC.

Price

Borland C retails for \$210. No prices were available for the libraries at the time of writing.

Conclusion

It's easy to write a conclusion when

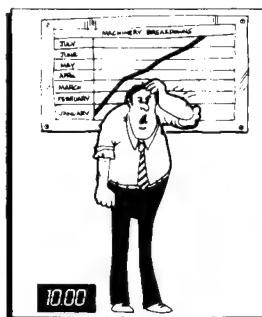
there is a clear winner but, unfortunately, in this case there isn't. All three programs are excellent, and any one would make a good choice for PC owners looking for a C compiler.

At first sight Mix C looks the least attractive because it produces large, slow programs and does not include advanced features such as the MAKE utility. However, Mix C has a truly excellent tutorial which probably makes it the best buy for an absolute C novice who has to start from scratch. If, after using Mix C, you want to

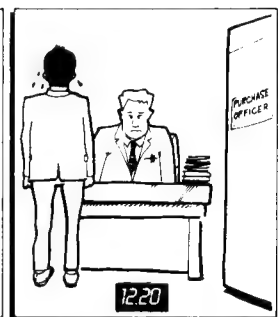
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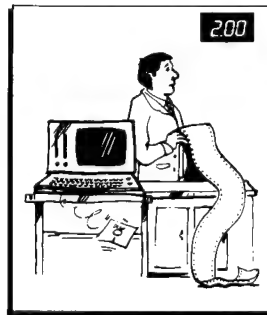
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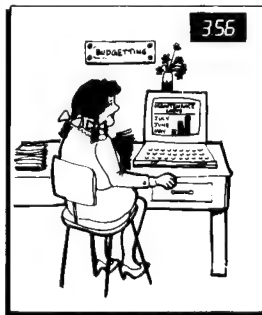
2. What are our hardware performance figures?



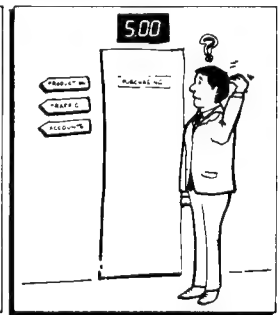
3. What are our hardware associated costs?



4. What hardware problems are outstanding?

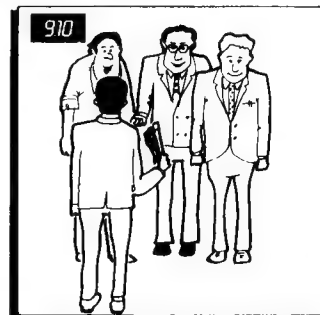
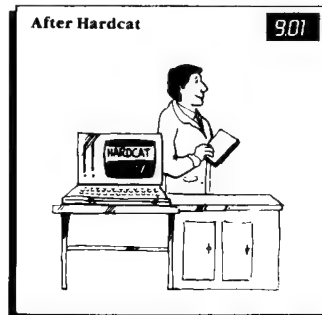


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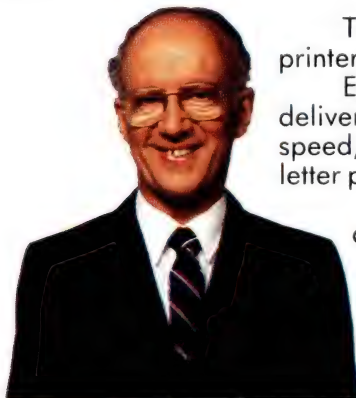
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create a large program, you would be well advised to upgrade to one of the other two compilers.

Zorland C and Turbo C are more than a match for the so-called professional C compilers costing in excess of \$500. The best overall performance was given by Turbo C. It is eminently qualified to take a Basic programmer, for example, and lead him or her all the way to the creation of real applications under C; firstly, with the integrated environment, and then onto a true multiple source file with conditional compilation.

Experienced programmers might find Zorland C the easiest to work with as it's the most similar in function to existing heavyweight C compilers. It is also cheap and very compatible with the very successful Lattice C environment — two arguments that certainly weigh heavily in its favour.

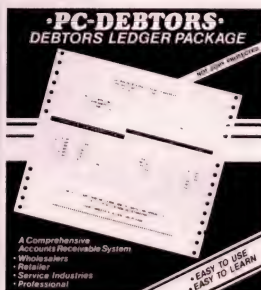
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Mix C is available from Tech Flow on (047) 58 6924; Zorland C from ISD on (03) 222 2288; and Borland's Turbo C from PC Extras on (02) 319 2155.

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All systems go!

The curtain has finally been raised on OS/2, Microsoft's true, completely new, multi-tasking operating system. For PCs which use the 80286 and 80386 processors, the doors — and Windows — have been opened.

Robert Schifreen peers in for a closer look.

In April 1987 IBM launched its new range of PCs, the Personal System/2. These machines will, as IBM said, change the face of personal computing. However, it's probably Microsoft who will have an even greater impact. As IBM announced the new hardware, Microsoft finally raised the curtain on a multi-tasking version of MS-DOS, capable of exploiting the features of the 80286 and (in 80286 mode only) 80386 microprocessors. More importantly, the product will not be tied to IBM hardware, as rumour-mongers were suggesting prior to the launch, but is available to any compatible manufacturer or power hungry end-user.

The new operating system will not be called 286DOS, or CP-DOS, or DOS 5 — as some of the pre-April rumours suggested. It will be known as Microsoft Operating System/2 or the IBM Personal Computer Operating System/2 or the IBM Personal Computer Operating System/2 Standard Edition, depending on whom you buy your copy from.

Although some companies will have you believe otherwise, PC-DOS running on a new PS/2 machine is *not* known as running under OS/2. OS/2 is a totally new operating system that requires most existing MS-DOS and PC-DOS software to be rewritten or substantially altered.

The time scale for OS/2 is roughly this: software developers are now taking delivery of the initial version of the OS/2 toolkit, though many have gone out already. This kit will contain a pre-release version of OS/2 version 1.0, and some compilers and technical information necessary to write applications to run under OS/2, or convert existing MS-DOS and PC-DOS software.

Towards the end of this year, version 1.0 of OS/2 will go on sale to end-users, at a price of \$706.

In the fourth quarter of this year, or early 1988, OS/2 version 1.1 will be launched. This will include Presentation Manager, which is basically a version of Windows which runs under OS/2 rather than MS-DOS. Until OS/2 version 1.1 arrives, complete with mouse and graphics-based Presentation Manager, OS/2 will be driven from a command line in the same way as MS-DOS.

In late May, Microsoft arranged for me to see the current version of OS/2. At the same time, IBM allowed me to visit its research and development establishment to take a look at a very early version of Presentation Manager. This, roughly speaking, will be to OS/2 what Windows is to MS-DOS.

MS-DOS

MS-DOS, the Microsoft Disk Operating System, is a single-tasking operating system used by around 99 per cent of PC owners. It comprises three programs, in three separate files on disk. The first two are the guts of the whole system and are usually called IBMDOS.COM and IBMBIO.COM. These two 'hidden' files are present on every bootable MS-DOS disk.

The third and final part of MS-DOS is COMMAND.COM. This is known as the Command Interpreter, and it is this which displays the A> or C> prompt and calls procedures to load the program you specify. COMMAND.COM itself does not contain the routines which make up MS-DOS — it calls on the guts of the system which were loaded into memory from the two hidden files.

COMMAND.COM also processes the resident commands — those that are built into the system — like DIR, COPY, DEL, and so on.

Programs call MS-DOS from the machine code level through the INT

command. If you write machine code programs, you use this command directly in your program to specify what you want MS-DOS to do. If you write in a high-level language like C, the compiler generates the necessary INT commands for you.

Version 3.30, now generally available, is the latest release of MS-DOS. It is still only single-tasking, and still limits you to 640k of RAM and a 32Mbyte hard disk (though you can have multiple 32Mbyte partitions).

OS/2

OS/2 is a completely new, truly multi-tasking operating system for PCs that use the 80286 or 80386 processors. OS/2 is capable of using the protected mode of the 80286 and 80386 (in 286 mode) chips, which means that programs are protected from each other and, if one crashes, any others which are running continue normally.

Protected mode is not available on the 8088 and 8086 chips, as used in standard PCs. These only have what's known as 'real' mode. In real mode, a program has total control over the entire machine, including all its memory and hardware. If it wants to, a program can control the screen by directly programming the graphics chip. Equally, if it wants more memory, it just looks through the system and finds some.

All this is fine on a single-tasking machine. With multi-tasking though, you have to be more careful. You can't allow a program to control the graphics chip directly, as another program running in the background might be trying to do the same thing at the same time. And there's no way that you can let a program have free rein over the machine's total memory, as it could corrupt another program or its data. The advantage of protected mode is that, if

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one program crashes, others that are running at the same time will not be affected and carry on running.

Although multi-tasking, OS/2 is only a single-user operating system so it can't be used to run a network without the optional (and still not launched) LAN manager.

For owners of 8086 and 8088-based PCs who will not be able to use OS/2 at all as these chips do not have a protected mode (including the IBM Model 30) and for those who don't want to pay for OS/2, MS-DOS version 3.3 will still be sold and supported by both IBM and Microsoft.

If you have a 286 or 386-based PC currently running MS-DOS, there's no need to switch completely over to OS/2. File and disk structures are the same so, whichever operating system you choose to install on your hard disk, you can still boot from a floppy disk that contains a copy of the other. Hard disks are still limited to multiple 32Mbyte partitions.

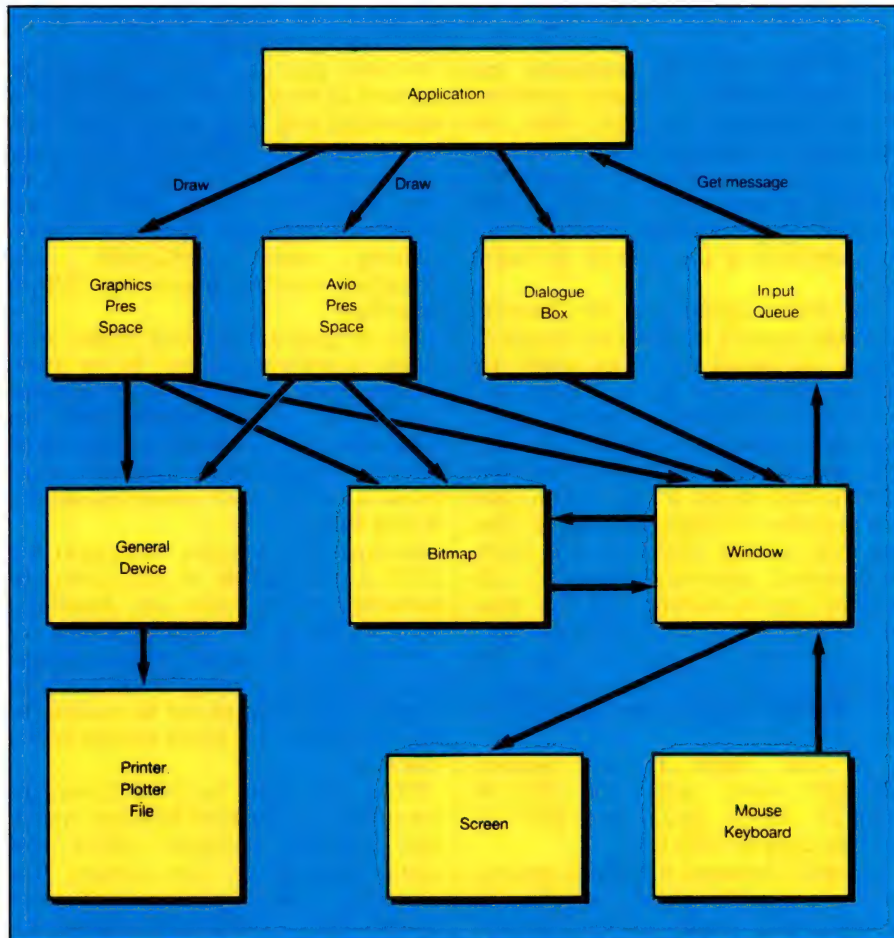
Apart from being multi-tasking, the biggest improvement over MS-DOS is OS/2's ability to break the 640k barrier at last. Programs running in protected mode can use 16Mbytes of real memory and, by using disk files for swapping, one gigabyte of virtual memory.

OS/2 version 1.0 will be available to end-users in late 1987 or early 1988. Like MS-DOS, OS/2 version 1.0 is a command-line operating system, complete with A> or C> prompt, at which you type commands, just like MS-DOS. There is no graphics-based mouse-driven interface.

During the second quarter of next year, version 1.1 of OS/2 will be made available; this will include the Presentation Manager as an integral part. The Presentation Manager is, to the user, a Windows lookalike. When you boot up OS/2 version 1.1, you will go straight into the windowing environment. If you insist on using OS/2's command-line interface, it will be available as an option from the Presentation Manager menu.

OS/2 in use

The version of OS/2 which I had a chance to use was a beta version of 1.0, running on an IBM AT with 1.5Mbytes of RAM. There was no hint of the Presentation Manager. What I saw was working properly, though some of the headings and terminology may still change. It didn't crash at all. Because the software was not finished, it was not possible to measure speed, or examine the drop in speed with



This shows the message paths between the system and a Presentation Manager application. The application accesses the screen by opening a communications channel known as a presentation space, which in turn accesses the screen via OS/2 calls. The application can also put dialogue boxes on the screen by sending a message to the dialogue box handler. All incoming messages come from the input queue, and the application examines the message to see what it says and where it comes from.

The Windows box contains a high-level representation of the screen, while the bitmap contains a bit-mapped version. A program can read and write to either of these, depending on what it wants to do, and can copy portions between the two

respect to the number of concurrent programs running.

When you first start OS/2, you are presented with a menu known as the Session Manager. This is not graphics-based, but just a list of options surrounded by a box. Initially, there are two options on the Session Manager menu. The first, called COMMAND.COM, lets you enter an MS-DOS 3.3-compatible command interpreter. This runs in the lower 640k of the machine, just as it would if you were using plain MS-DOS 3.3. If you don't want to devote an entire 640k to this DOS 3.3 environment, you can assign less memory to it.

When you select COMMAND.COM from the menu, the screen clears and

a familiar C> prompt appears, preceded by a copyright message. From this prompt you can do anything that would be possible in DOS 3.3, including obtaining directory listings or running any program that runs under MS-DOS. This DOS 3 environment is not running a real copy of DOS 3, but is emulating it. At least, it's emulating everything apart from network calls, which aren't supported.

To the user, running in this way looks and feels exactly like running a standard MS-DOS machine. The main difference is that while the DOS 3.3 program is running, pressing the Sys Req key (this may change on later versions) returns you to the Session Manager screen, freezing the program

that is running but preserving it in memory.

OS/2 does this by switching the processor between real and protected mode. According to Intel, such an operation is impossible. Microsoft has found a way of doing it, though the method is secret. If it really is that clever, it may not work correctly on future versions of the chip or on every clone.

The other option on the Session Manager screen is 'Start A Program'. When you select this, once again the screen clears and a C> prompt appears on the screen, preceded by a copyright message informing you that you are running under MS-DOS version 5. This is just a code name, and will probably be changed to OS/2. You are now running CMD.EXE, the OS/2, multi-tasking command interpreter. Or actually, you're running just one copy of it. Like the DOS 3.3 command line, you can start a program from the prompt by typing its name, and most of the MS-DOS internal commands work too.

You can return to the Session Manager menu, select the Start A Program option again, and start up another copy of CMD.EXE.

To switch between running programs, only one of which can be onscreen at a time, you return to the Session Manager menu and select the one you want. The entry on the menu will change to reflect the program that the particular copy of CMD.EXE is running at the time. To remove an entry from the menu, you quit a command processor by typing EXIT.

Programs running under CMD.EXE must be specially written applications — you cannot take any old MS-DOS

program and expect it to run under OS/2, except in DOS 3.

In total, you can have 15 programs running at once. Each is started from a command line, from either CMD.EXE or COMMAND.COM. You can only have one copy of COMMAND.COM, as this uses the lower 640k of the machine's memory. The other tasks, running under CMD.EXE, use protected memory above the 1Mbyte boundary.

Like a program running under Windows, a program written to be multi-tasking under OS/2 can't just assume control of the machine and its hardware: for example, it can't write directly to the screen. Instead it must make a call to OS/2, which will do the writing instead.

Because the program running in the DOS 3 environment is not running in protected mode, and can, therefore, write to any of the machine's memory or directly to the screen, it was decided that a program running under the DOS 3 environment would not be multi-tasking. Therefore, the whole system works like this:

When you select the DOS 3 environment from the Session Manager menu, that program becomes active and starts running on the screen. Any protected-mode programs that were started from a CMD.EXE prompt will still multi-task in the background, but cannot communicate with the DOS 3 program.

When you leave the DOS 3 program by pressing the Sys Req key to return to the Session Manager, the DOS 3 program stops execution while it is not visible on the screen. This is to prevent it from writing directly to the screen or memory and so crashing the system.

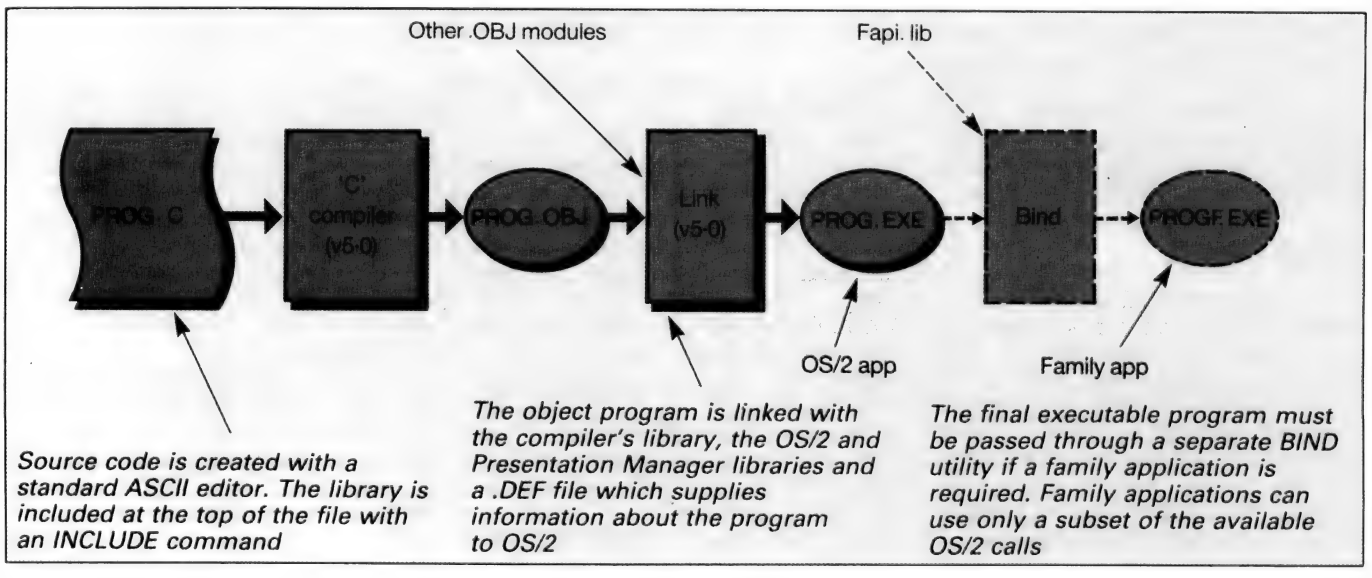
All programs run from the CMD.EXE prompt are true multi-tasking programs and continue to execute even when not visible. You can only have one program visible on the screen, though.

To prove that true multi-tasking was indeed taking place, I started a program that played a tune through the machine's speaker. With this initiated, I returned to the Session Manager and started another copy of CMD.EXE, from where I executed another program. All the time that the second program was running, the tune still continued.

Although only one program is visible at a time, a program running in the background has the ability to communicate with other running programs, and to display information on the screen. So, for example, you could leave a spreadsheet recalculating while getting on with some word processing, and a message would pop up on the word processor screen when the spreadsheet was ready.

Pop-up programs in the MS-DOS sense are no longer required, although something like SideKick runs perfectly well in (though only pops up in) the DOS 3 environment. Making a pop-up program that works under OS/2 is just a matter of writing the program and leaving it running under its own copy of CMD.EXE. If it spends most of its time just waiting for keyboard input, it won't slow the system down at all.

OS/2, as I have said, is a true multi-tasking operating system. It is not based on the message-passing principle (see under 'Windows' for details) but is a time-slicing system, so each running program gets a certain number of milliseconds of the CPU's time, and each program is serviced in rotation.



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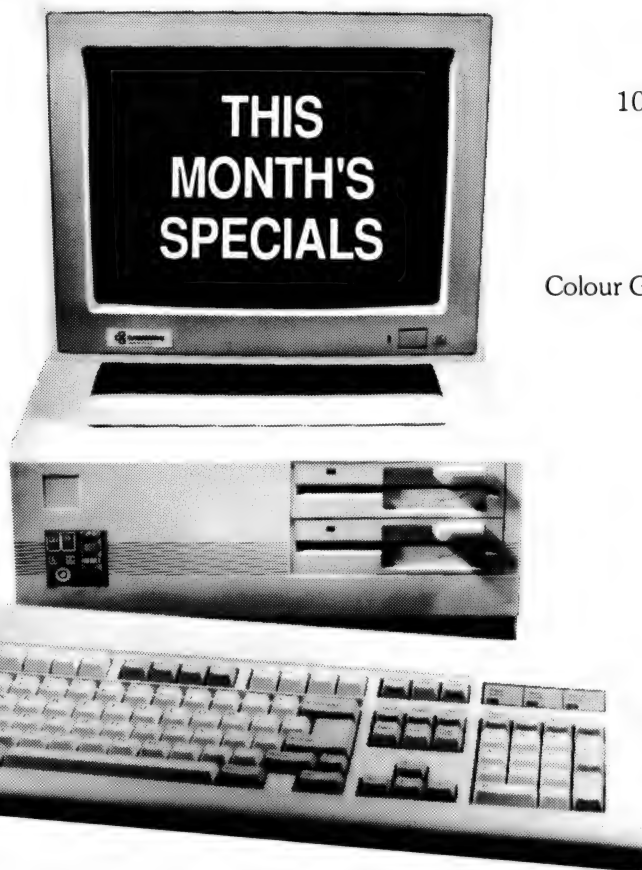
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The number of milliseconds that each receives is defined by a command in the CONFIG.SYS file (it defaults to 32), and you can also specify a priority order in the same way. The actual number of milliseconds you specify is converted into a number that represents a whole number of clock cycles.

AUTOEXEC.BAT is still used, and is executed the first time you enter the DOS 3 environment. If there's an auto-executing file for CMD.EXE, I couldn't find one. Device drivers, incidentally, will have to be totally rewritten from their MS-DOS versions, to be able to support the system in both real and protected mode.

On the version of OS/2 that I used, the operating system itself occupied around 250k. This compares with around 70k under MS-DOS, where each of the three system files are roughly 20 to 25k. You need a system with at least 1.5Mbytes of RAM to use OS/2 version 1.0. IBM told me that, by the time Presentation Manager becomes available, a PC making full use of the system's facilities and wishing to run a number of concurrent tasks will require at least 4Mbytes.

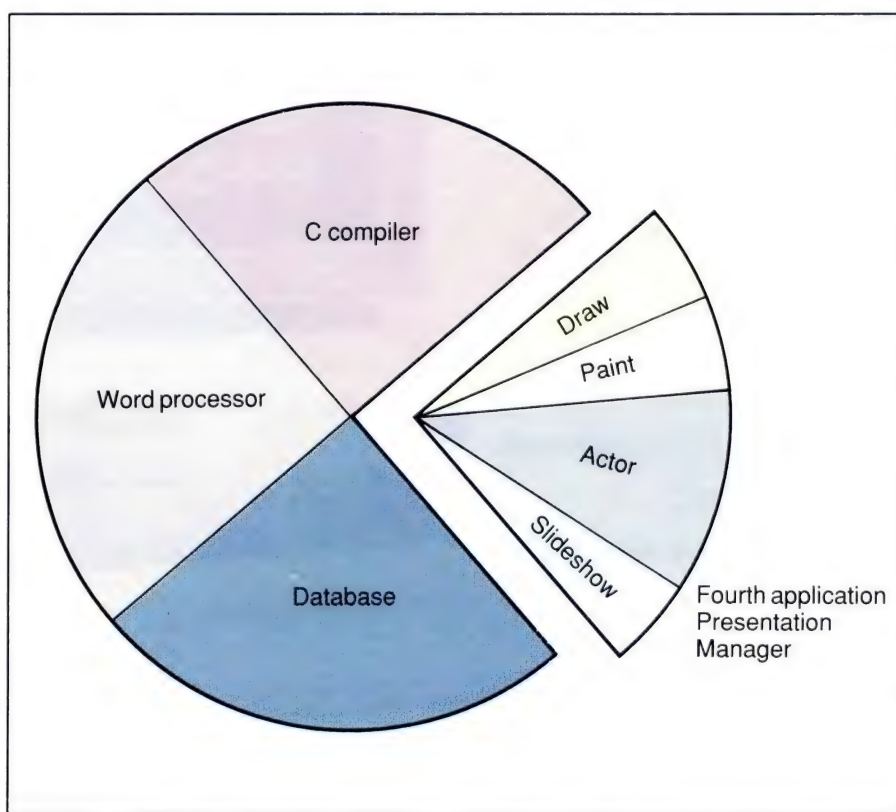
CMD.EXE, the protected-mode command interpreter, currently weighs in at about 42k. COMMAND.COM, the command interpreter for the DOS 3 environment is 25k. The hidden files (equivalent to MS-DOS's IBMBIO and IBMDOS) total about 180k.

Writing for OS/2

Any program that currently runs under MS-DOS version 3 will run happily in the DOS 3 environment under OS/2 with no modifications. The only exception is certain device drivers and network applications.

Under this environment, though, you don't achieve the power or flexibility of multi-tasking. To run a program from a CMD.EXE prompt, in protected mode, it has to be specially written. To write such a program, you need a special compiler. Microsoft has just announced C5, which is version 5 (the OS/2 version) of its C compiler and not an interpreter powered by a washing machine motor. Quick C, Microsoft's retaliation against Borland, will also support OS/2 and is designed for writing quick prototypes of OS/2 applications. It is not an optimising compiler so you'll need C5 as well. Other languages to be announced include Fortran, Cobol and Pascal, as well as an assembler.

The main reason for the change of compilers is that there is no longer an INT command. Programs no longer



This pie-chart shows how the processor's time is sliced under OS/2 to service a maximum of 15 tasks, though only four are shown here. Presentation Manager is just one of those tasks, and it splits its share of the processor's time among the programs it is running

have the power to control the system or hardware directly (and OS/2 doesn't use the machine's BIOS at all); instead, they have to call on a set of 200 or so subroutines, which provide everything that the old INT commands did under MS-DOS. The compiler just generates CALL commands to access them.

If you stick to a certain subset of these calls, you can write what's known as a family application. This is a program that will run under OS/2 in both protected and DOS 3 modes, and also under a normal version of PC-DOS or MS-DOS 3.30 on a standard PC or AT.

A program written for OS/2 has to supply a lot of information to the system before it runs, like which parts of memory it intends to use and the library routines it calls. All such programs have to be .EXE files. Except in the DOS 3 environment, there is no such thing as a .COM file.

Windows

Before looking at Presentation Manager, the graphics interface for

OS/2, it's helpful to examine its predecessor, Windows, which has been available on standard PCs for some time.

Windows is a graphics-based operating environment that provides multi-tasking even on a standard MS-DOS machine — even 8086 or 8088 based PCs.

Windows 2, due to be launched around the same time as OS/2, is similar to the current version and will run on 8088/6 machines too. The main difference is that the layout will change to resemble Presentation Manager. It will also feature overlapping windows, as opposed to the tiled ones that Windows uses.

Windows 386, also awaiting launch, will run only on 80386-based machines. The 80386 has the capability to simulate 16 separate 80286's running simultaneously. Again, Windows 386 will have the same user interface as Presentation Manager.

Strictly speaking, Windows is not an operating system in its own right as it sits in memory above MS-DOS. However, because of the clever things



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that Windows can do, most of which are not available with MS-DOS (especially the multi-tasking facility). Windows makes hardly any calls to MS-DOS (that is, it uses hardly any INT commands).

There are two major differences between operating under Windows and MS-DOS. Firstly, Windows is graphics-based instead of command-based. So, instead of typing a command to start your word processor under MS-DOS, Windows would present you on the screen with a list of file names, and you'd point with the mouse to the name of the word processor and click a button. The second major difference between Windows and MS-DOS is that Windows is multi-tasking.

Assuming you have enough memory, there's no limit to the number of programs that can be run simultaneously under Windows.

For Windows to be able to do what it does — that is, provide multi-tasking on a machine not designed to do it — it has to take over the hardware of the machine completely. Therefore, a Windows application must not write directly to the screen, or read from the keyboard, or do anything that an MS-DOS program would do. Instead, the application has to send a 'message' to Windows.

Windows is known as a message-passing operating system. A program running on its own under MS-DOS has complete control of the system, and it can do what it likes without getting in the way of other programs that may be active. Under Windows, a program can't be allowed to behave like this; rather, it acts on messages. A message is a piece of information sent by Windows to a program, to tell it that something has happened or is about to happen. At the heart of a Windows program is a loop that simply waits for Windows to send it a message, and then acts on that message before returning to the loop to wait for another one.

There are four places that a message can come from: from the user pressing a key or moving the mouse; from Windows itself; from the current program (that is, a program sending a message to itself); or from another program.

A true multi-tasking operating system like OS/2 works by splitting the processor's time evenly among a number of programs. Windows, on the other hand, does not do this: it allows a program as much time as it needs to process a message. When it has finished processing a message, the program passes control back to Win-

dows and carries on waiting for more messages.

It is, therefore, possible for a program to crash Windows. Suppose a word processing program deals with a certain message (the user pressing the PgUp key, say) by just going into an infinite loop and not returning control to Windows. In such a case, the routine that processed the PgUp command would have total control of the system. The user couldn't press Ctrl-C to get out, because the message saying that Ctrl-C had been pressed wouldn't get anywhere. The computer would have to be rebooted.

Presentation Manager

The Presentation Manager is to OS/2 what Windows is to MS-DOS. It is a graphics-based operating environment that runs on top of OS/2. The difference is that Presentation Manager makes full use of OS/2 calls, unlike Windows, which hardly calls MS-DOS at all. Presentation Manager currently supports CGA, EGA and VGA display modes and uses each to its full capability. The development work on Presentation Manager is being done at IBM's laboratory, though the size of Microsoft's involvement is not clear. Certainly, there's bound to be some of the original Windows code in there.

The demos I saw were running on a PS/2 Model 50, though there's nothing at present to indicate that it won't work on any compatible AT. This is on condition that the clone manufacturer does not use the BIOS to provide compatibility, as neither Presentation Manager nor OS/2 uses the BIOS at all.

There will be no Presentation Manager with OS/2 version 1.0. It will appear for the first time with version 1.1, and will form an integral part of the operating system. It will not be available on its own — the OS/2 upgrade from 1.0 to 1.1 will include Presentation Manager.

IBM is also working on the Extended Edition of OS/2. This will be an enhanced version of Presentation Manager that includes a DB2 workalike — IBM's database program used on its minis and not to be confused with dBase II. There will also be a communications package to link the machine to a mainframe as a terminal. The Extended Edition will be an IBM product — there is no official Microsoft involvement and Microsoft will not sell it under its own name.

When Presentation Manager is first started, the user is presented with a menu, just like Windows' MS-DOS Ex-

ecutive. Although the menu uses graphics mode to provide fancy colours and fonts, the menu is text-based rather than icon-based.

However, the menu will not consist of plain eight-character file names. Instead, there will be fuller descriptions like Word Processor, Spreadsheet, Communications, and so on. These names are added to the machine's main start-up menu when a program is installed. If you haven't installed a program yet, or you want to call up a small utility program, there will be a way of choosing from file names instead. If you get stuck, there's full context-sensitive help available.

Another option on the menu will let you use the OS/2 command-line prompt as described above — similar to clicking COMMAND.COM from within Windows.

Presentation Manager runs as one of OS/2's 15 tasks, and is itself multi-tasking. So, you could theoretically have a DOS 3 environment, 14 different copies of CMD.EXE and Presentation Manager running at the same time on a machine, with Presentation Manager itself running an infinite number of programs. It's unclear at the moment whether you can run more than one copy of Presentation Manager!

Like Windows 2, Presentation Manager uses overlapping windows as opposed to tiled ones. IBM calls this approach the 'messy desktop' as opposed to a 'tidy' one. Switching between windows will be via the mouse, or with hotkeys.

Programs intended to run under the Presentation Manager again have to be specially written. It won't be possible to start writing them until version 1.1 of OS/2 is launched, as the extra CALLS will not be in the library of version 1.0.

Programming under Presentation Manager is similar to using windows. It is basically a message-passing operating system in its own right. Presentation Manager handles its own multi-tasking, splitting its CPU time among all the applications it is running. However, there is a small degree of true time-slicing, by which the Presentation Manager uses a regular slice of the processor to keep a check on what's happening. Consequently, if a message-handling routine goes wrong and does not return control, it's possible for the user to click on a menu option and kill off the offending process from outside of that non-functioning program.

To keep the size of .EXE files down,

PREVIEW

Presentation Manager and OS/2 support dynamic linking. If you have two programs which both use the same subroutine library (one that you have developed), only one copy of the library has to be in memory and both programs will use it.

Another space-saver is that if you run two copies of the same program at a time under either OS/2 or Presentation Manager (or Windows for that matter), only one copy of the actual code is loaded from disk. So, a system with only enough memory to run three programs if they were all different could typically run five copies of the same program.

A major headache for application programmers is the incompatibility between source code for Windows applications and Presentation Manager ones. At the very least, Windows programs will need to be recompiled under an OS/2-compatible compiler before they can run under Presentation Manager.

In addition, the names of most of the CALLs have changed, so the command to draw a line under Windows will not be the same under Presentation Manager. And the order of some parameters will change, too — you may have to specify the size of a rectangle as length, width instead of width, length.

Despite assurances from Microsoft to the contrary, it seems that the conversion process will not be trouble-free.

Conclusion

The IBM AT has come and gone over the last two years, and no operating system was able to make full use of the machine's hardware. The days of the 8088 and 8086-based PC are numbered, and so, it may well prove to be, are MS-DOS's. There is no doubt that OS/2 will be to MS-DOS what MS-DOS was, in turn, to CP/M. There will still be many dedicated bands of MS-DOS followers — after all, not everyone wants to run more than one program at a time, and 640k is more than enough for a lot of applications.

The familiar command line will still be there to comfort those who have grown used to it since 1981, but Presentation Manager will be available for those who want to use the machine without caring how it works.

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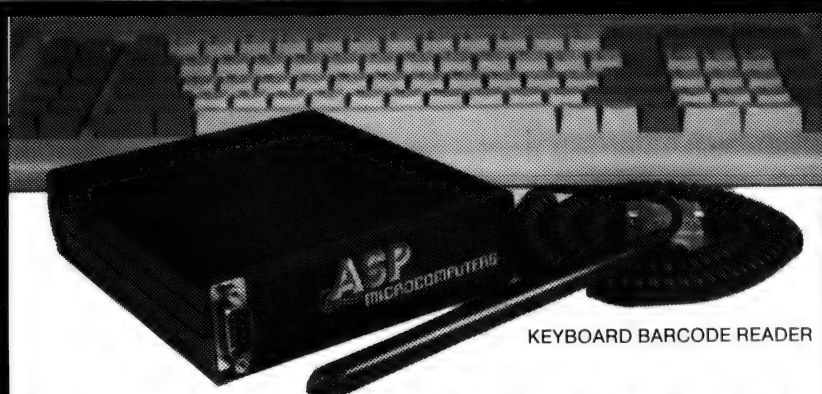


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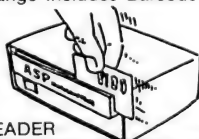
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TCH169



LETTERS

This is your chance to air your views — send your letters or contact us via Microtex on Telecom's Viatel, page 666. The address to write to us is Australian Personal Computer, 124 Castlereagh Street, Sydney 2000.

Verbal overkill promises nothing

I am becoming thoroughly sick and tired of reading in the computer press the recent airings of some software houses, prognosticating their intention, 'at some future date', of releasing software which will do this, that and, more than likely, the other as well.

The industry has coined a choice expression for this indecision — 'vapourware'.

Companies which, a year or two ago, would not have dreamed of dropping a whiff, inkling or hint of their development plans, are now falling over themselves to proclaim to the world what they are going to release *mañana*.

Witness the recent bal-lyhoo over Lotus' carefully stage-managed leak regarding the LAN version of 1-2-3, and the company's subsequent red-faced admission that this launch was being pushed back.

Notwithstanding that little episode, we have been entertained recently with *more* prophetic verbalisations from the software industry's most famous and persistent litigant. Support for VGA and OS/2, 3.5in media, a mainframe version of 1-2-3 and a DBMS have all been promised definitely . . . sometime in the future . . . probably.

Never before has so much vapourware been released into the atmosphere at one sitting. One can only surmise that the PR pundits at Lotus have been feeding on an exclusive diet of curry,

sultanas, radishes and lager recently.

What is the reason behind all this huffing and puffing? Could it be the old wile of keeping the opposition at bay while you buy time to grind your own development effort into top gear? We should be told.

T Beken

Taking technology too far

My initiation into computers involved bashing out punch cards which I never quite learned to read reliably, and waiting two days for a short (twelve-page) printout which could best be summarised as 'Program crash on line 20'. (Notice the helpful addition of a line number which was probably a facility added by a mad, hacker student.)

The new, cheap PC-compatibles have produced lots of new users who know nothing of computing, and are able to jump direct to the very high-level interpretative languages of, say, WordPerfect, Lotus 1-2-3 or GEM Basic.

But while there *is* a market being served here, the computer user base is becoming complacent and — in some 'yuppie' quarters — arrogant about its understanding of computers.

GEM and Windows may be blatantly annoying both to use and to program within, but I fear they are the punch card of tomorrow's computing. Soon, the user interface programmer will become more important than the researching, register-juggling and general-

ly innovative in-house subroutine/utility programmer.

Sure — the world will end up with lots of slow, unimaginative, beautifully packaged, over-hyped, mindlessly over-graphic, intentionally incompatible total office environments. In response, the manufacturers will have to make faster and faster machines in order to get these programs up to a sensible speed.

I'm not sure who will benefit in the long run. But, when I am woken up with a cup of tea and a digitally-synthesised 'Good Morning!' from my 25GHz, 1024-bit 804586Motorintel-based IBM clone, I will still be worried that, if I add just one more background utility, I'll use up my last gigabyte of memory; or I might drop my terabyte holographic optical disk down a crack in the floorboards and never find it again.

W Roberts

No syntax errors please

In recent months APC has published several excellent memory resident programs by Ian Davies and Jeff Proside (XDIR.COM). They both used different approaches when typing in the program. As my Macroassembler is faulty, I was obliged to take the Basic method.

Ian Davies adopted the more common hex format in the data statement section of the Basic program, thereby requiring fewer key presses pro rata. Additionally, he also gave the offset addresses and the hex bytes alongside the assembler statements.

With this approach, I had a better understanding of the program and had the choice of keying in the hex values using the 'e' command under Debug. In fact, using the 'e' command is far less frustrating with no syntax errors and fewer key presses (I only have to worry about the correct hex bytes and the space bar; no punctuation marks, not even the enter key), than using either the 'a' command under Debug or Macroassembler.

On the other hand XDIR.COM is a very long program made longer by the use of decimal values in the Basic data statements, not to mention the absence of offset addresses and hex bytes alongside the assembler statement. Having laboriously keyed in the XDIR Basic program, I was being prompted for errors in the data statements where none existed. To cap it all I accidentally lost the whole program. I was then obliged to translate some 1500 decimal values into hex which I then entered using the Debug 'e' command. It worked the first time.

Perhaps you could set a standard for future programs by requiring the authors to use the approach taken by Ian Davies.

S Kamaldeen

Modem users unite

I have just read M Taylor's letter (June APC), and I am surprised at the solution he/she has to the problem of the proposed charges that Telecom is planning for the operators of privately owned Bulletin Boards. Quote

LETTERS

"Anyone want a modem?" Unquote. What an answer! It's no wonder good services go down the drain when users have an attitude like that!

On that vein, I throw a challenge out to all of your readers who utilise the facilities provided by these people to stand up and be counted, literally.

Write letters! Write to the Federal Minister for communications and tell him how you feel about this outrage. Unless you do this, your voice will not be heard.

I have read many letters and articles in computer magazines recently decrying the heartlessness of Telecom, but how many have written to the Minister concerned? When you count the number of bulletin boards around Australia, then multiply that by the number of registered users of each board, that comes to a lot of letters flooding

into the Minister's office, telling him what the people want.

Come on Aussie, come on. Write those letters. Let it be known what you want. Don't sit back and be dictated to.

PS. I have more faith than M Taylor. I'll buy the modem!
B Collin

Storyboard patch

I have been using IBM's graphics package, PC Storyboard on an IBM PC/XT for a while. I have also run it on various IBM clones, but recently I bought a Blue Chip system and the PM.EXE module of PC Storyboard does not run. Someone in Melbourne has a patch for it, but he is not willing to share it with other PC enthusiasts unless paid substantially.

Would any of your readers have a patch for the software which he/she might share with others?

M L Smith

END

TELEPHONE MESSAGING



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AFOR 151

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Omnis Quartz

Omnis Quartz is a powerful relational database for the PC available from Busiware in Sydney. Quartz can be heavily customised, and runs under Microsoft Windows — the first database to do so — in a multi-tasking environment. Derek Cohen and Nick Walker tackled its comprehensive facilities.

Back in 1982, an Apple dealership, Blyth Software, decided to apply its expertise in building turn-key systems to developing its own product. Thus was born Omnis — a database management system for the Apple II. Later came Omnis 2 and, two years ago, Omnis 3 for the Macintosh. Omnis 3 Plus, the latest Mac version, has for a long time been outselling all the other Mac database products put together.

Omnis 3 Plus is available in a multi-user version and is the basis of Blyth's multi-user accounts system, Omnis Accounting, for networked Macs. Omnis 3 for PC-compatibles was launched in 1986, but was a poor text-based shadow of the Mac product, although it shared many of the same capabilities. It has, however, spawned the vertical market Blyth Craftware range of applications.

Now Blyth has produced the first fully programmable relational database to run under Microsoft Windows. Omnis Quartz bears many similarities to its Mac predecessor, but has the added advantage of being able to use the multi-tasking capabilities of Windows including running in the background.

System requirements

Omnis Quartz is designed to run on an 80286 or 80386-based PC with a minimum of 640k of RAM and a hard disk.

During this review, Quartz was run mainly on an AT compatible but was also tried on an Amstrad PC with 512k RAM. The reduction in speed was quite noticeable and, while Quartz will

run on much less well-endowed machines, it is wise of Blyth to specify such as a minimum-desirable configuration.

Additionally, Quartz needs a full version of Microsoft Windows installed for your particular machine and printer. A mouse is desirable, as using Windows-based applications totally from the keyboard is possible but tiresome. A colour monitor is not essential but colour does improve the organisation of the application.

Windows cannot at present make use of extra memory operating under the Lotus/Intel/Microsoft standard, but when it does Blyth claims that Quartz will use it too.

General description

Quartz operates totally within the Windows environment, using the pull-down menus, overlapping windows, scaleable fonts, scrollable lists and dialogue boxes common to all Windows applications.

A Quartz application consists of a number of different elements, all of which are under the programmer's control. The end-user will interact with the finished program through pull-down menus, entry layouts, reports, lists (which are in effect onscreen summary reports) and dialogue boxes. In conjunction with a set of file formats which define the fields for the various record types, the user can process the information held in a separate data file. One application library of file formats, layouts, menus, and so on, can be ap-

plied to an unlimited number of different data files.

Quartz is also accessed by means of these Windows elements. Entry layouts, pull-down menus and scrollable list windows are used to make selections, build up sequences of commands in the Quartz programming language, and define the functions of the finished database application. Because the programming environment and the resulting product share a common interface, Quartz itself becomes a model application from which to learn.

Anyone used to the multiplicity of disk files common to databases like dBaseIII will find the Quartz organisation slightly alarming at first. Quartz consists of just two files: QUARTZ.EXE, the 420k program; and QUARTZ.INF, a 512-byte file which holds the product registration details, system defaults and the name of the last application used.

Each application will typically produce only two disk files. The first, with an extension 'QAP', holds all the fixed information such as layouts, file and report formats, and menus. All the data is held in another file with the extension QD1; this can hold up to 2560Mbytes of data. And if this is not enough (though it's not clear where at present you'd hold files this big), you can chain on further data files with the extension QD2, QD3, and so on.

Quartz organises the information within the single data file, and up to 60 separate or related sets of records can be stored with their indexes. Nonetheless, it is useful to be able to describe

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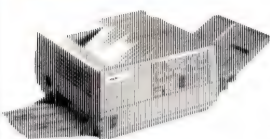
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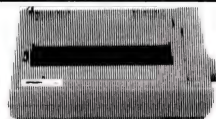
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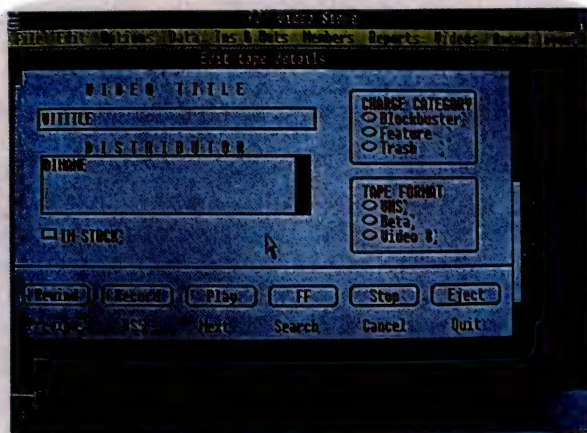
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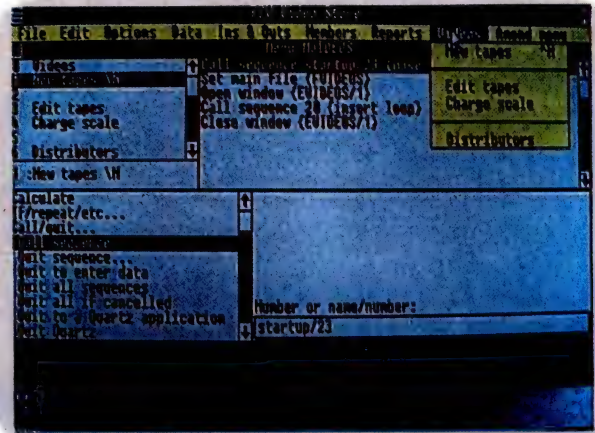
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Entry Layout

The two boxes on the right of this entry screen contain radio buttons with each box linked to a particular field. The central box is a list field and, in use, a list of distributor names will be displayed with scroll buttons in the red bar. The programmer can determine the effect of clicking on a line in a list field. When any of the push-buttons at the bottom are clicked, they activate procedures stored in the menus.

In this application, the 'Record' button was designed to perform two functions: to start editing a record; and to indicate that the edit had been completed. A conditional loop in the connected sequence changes the value of the button's label variable — `#$5` — as the process takes place and tests this variable to determine whether to start editing or save the edited record



Amend Menu

The sequences of commands or procedures which drive Quartz are stored inside the menus. The menu line names are defined on the left, and the commands which are executed when that line is clicked or called are defined in the right-hand window. Leaving two blank lines in a menu defines the end of the visible part of a menu, and the rest of the lines can be used to store procedures called by number, by pushing buttons or other sequences. 'New tapes' has been associated here with a hot-key — control-N.

Creating a sequence of commands involves clicking on a series of available commands from the bottom right-hand list. Any parameters expected (such as the parent menu and number of a sequence called as a subroutine) are prompted for bottom right

each set of records as belonging to an imaginary file, even if this is a logical rather than a physical entity. Up to twelve fields can be indexed within each file format, and indexes are automatically selected and maintained whenever the file format is used.

Each pull-down menu can display up to 20 items, with the option of separator bars to group the choices. There can be up to twelve menus installed at once, and commands are available to add or remove menus, to place a check mark against particular choices, and to 'grey out' certain items which are either not applicable or require an access level the current user does not have. All Quartz windows and menus can be password-restricted with up to eight access levels available.

Selecting a menu item can lead to further menus being installed or, more frequently, the opening of windows on the screen carrying entry layouts or the production of printed reports.

Unlike most databases, where the programming instructions are stored in a file of their own, Quartz stores these

instructions, known as 'sequences', within the menu structure.

Each menu can contain 100 items, though only the first 20 can be displayed. Associated with each menu line can be a sequence of commands, with each sequence holding up to 5000 bytes, and a total limit of 30,000 bytes of storage available per menu. Each line has a number, and can be given a name which will appear on the menu bar if that line is visible. A window alongside shows the sequence of commands attached to that line; and the lines below 20 — or below those visible if this is less than 20 — are where the programmer enters and stores the sequences of commands. These sequences may be called by other sequences, or by clicking on menu choices or push buttons on any entry layout.

Entry layouts can each consist of up to twelve separate, sizeable and positional windows. On each layout window the programmer can position fields of the following types: entry or display fields; check boxes for setting the logi-

cal value of a field; lists, complete with a vertical scroll bar; radio buttons; and push buttons. In addition, free text and box rules can be used to annotate and organise the layout.

Radio buttons take their name from the channel selectors on car radios — only one button can be selected at any one time, and choosing one (by clicking on it with the mouse) de-selects the current choice.

Push-buttons are a feature common to most WIMP environments — they are the buttons the user clicks to initiate some activity. Standard push buttons are available for moving forwards and backwards through a file, and for finding, adding or deleting records.

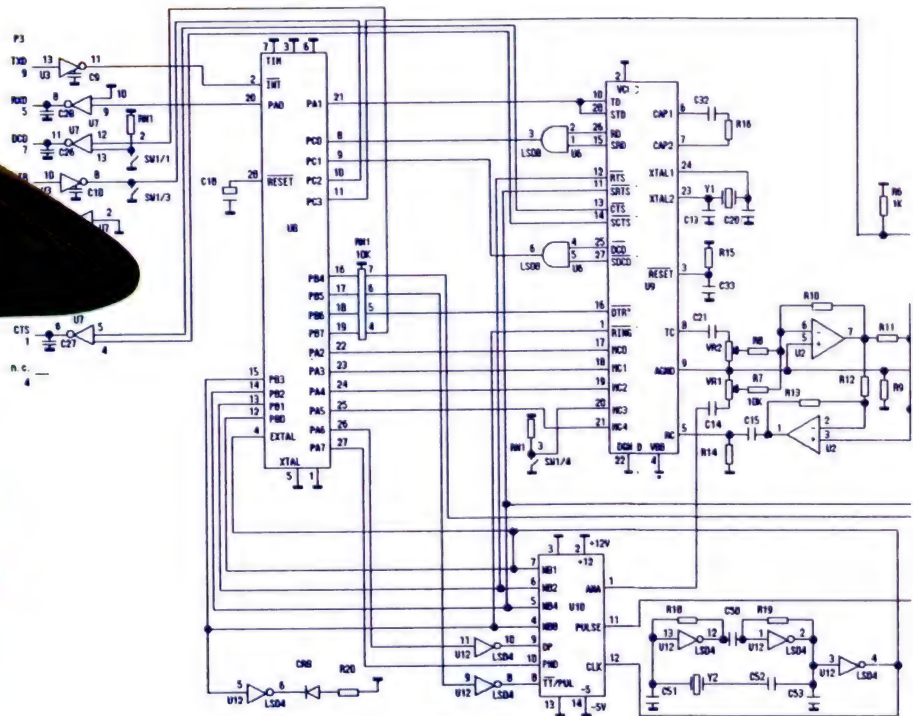
However, push-buttons can be linked to the programmer-defined sequences which are stored in the menu formats. Thus a push-button marked 'New Title' could invoke a sequence that opens a fresh window with the cursor in the first field ready to accept data for a new record, checks the data, adds the record, and then returns to the original window.

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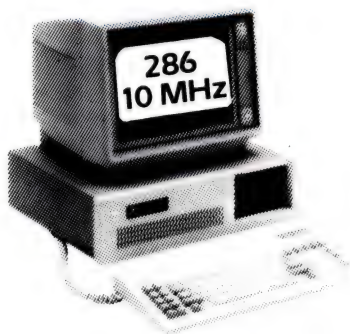
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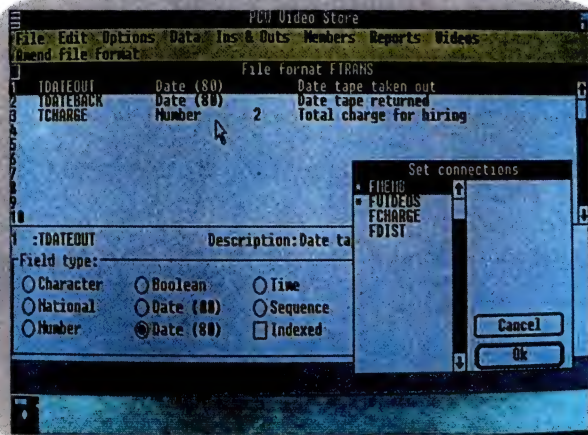


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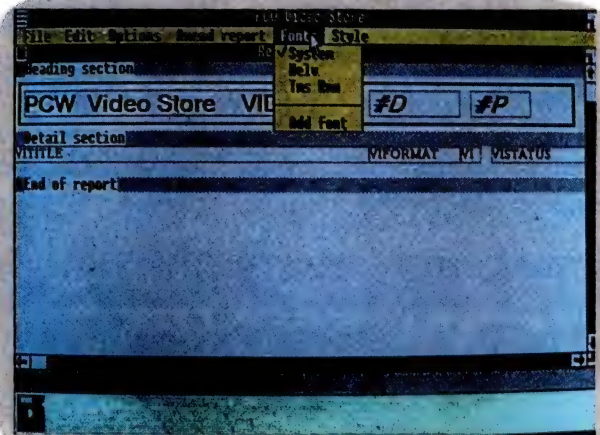
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File Formats

Among the field types available in a file format are two date options — one starting at 1900, the other at 1980. National fields are sorted in a different way to character fields to cope with accented characters. To set the connections between records in FTRANS and other files, the file format names in the Set connections box are double-clicked.

The maximum length of each field is defined here, though on an entry or report format, the amount of data displayed can be stretched or shrunk using the mouse



Amend Reports

Reports can consist of a number of different sections including headers and footers, and sub-total headings. Any number of records can be printed across a page, which is useful for printing labels; and the report destination can be changed at print time between the available ports, the screen or a file. Text and fields can be printed in various fonts and font styles and these attributes are shown on the report design screen. As well as fields, system variables such as the date (#D) and page number (#P) can be included

Lists are one of Quartz's most novel features. Up to eight lists can be current at any one time. Each is defined by a series of commands which specify the list number, the fields which will form one line of the list, and how the list will be made up. Lists can be used as a 'window' onto the records of another file, or as a way of displaying the options available to the user — for example, which reports are available.

Reports can be printed to screen, to printer or to a parallel or serial port. This latter option allows a Quartz application to make use of serial links or modems to send data down the line at the click of a button. Commands are available to set serial port parameters like baud rate, and to send a pre-determined string of characters to the port. This could be an auto-dial sequence to a modem, or a set-up string to initialise a printer.

A range of different fonts and font styles can be incorporated in a report, and the report design window shows these onscreen — very WYSIWYG, indeed. Sort and search formats can be included either automatically, or by being selected at print time by the user.

In use

To test Quartz APC designed a simple

video rental store application. We set up file formats for membership, video tapes and distributors. The tapes file was connected to the distributors' file: we limited each tape to one distributor, and had only one copy of each title.

Throughout Quartz, options are nearly always of the multiple choice type. The most typing we did was in specifying the text for the menus and entering textual descriptions.

Quartz does not support many-to-many linking of files, so we added a transaction file which would connect members with the video tapes they had rented. Having set up the basic file formats, we clicked the menu choice to set the connection between the transaction file and the membership and video tape files. Quartz opened up a window listing the other existing file formats, and creating the links involved merely double-clicking on the required file names. This file list was in fact an ordinary Quartz list that can be created for use on an ordinary layout window.

We next designed the menus. Each has a name and a description, the latter being what actually appears on the menu bar. If a menu is given the name 'Startup' it will be automatically installed when an application is opened. Additionally, the commands stored as menu line zero will be automatically executed.

Line zero of the start-up menu was as follows:

```
Set Quartz window title (PCW Video Store)
Install menu (MMEMBS)
Install menu (MREPORT)
Install menu (MVIDEOS)
Set 'About . . .' sequence 10 (About PCW . . .)
Call sequence 23 (make disk list)
```

This command sequence was created with very little use of the keyboard. A window at the bottom left of the screen displays a list of all the available commands or group of commands. Clicking on an item with three dots after it opens up — outline processor fashion — further options. Double-clicking any line copies it into the current sequence. Where a command requires parameters, check boxes or further lists of valid options will appear on the bottom right of the screen. Therefore, selecting the command to set the main data file will open a list of the existing file formats, and clicking the required file name copies the completed command line into the sequence.

To call another sequence, it is necessary to specify it by number, or menu format and number if it is not within the current menu. Names cannot be used, unfortunately. However, the actual name of the sequence is entered, and

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if the 'sub-routine' sequence is later edited and renamed, this change will be reflected in the name shown in the calling sequence. In the aforementioned menu, sequence 23 was referred to by number, and the description added automatically by Quartz.

This may all sound quite convoluted, but it is possible to establish a complex sequence of commands quite quickly once you become familiar with where the command you want is in the list. When a menu has been set up, printing the entire set of sequences provides not just a fully commented program listing, but a note of how much space has been used and how many errors have been found.

A 'find' facility will locate where a particular string is in your own sequence of commands or menus, but, unfortunately, it cannot be used on the command list to help you find the particular command you want which somehow isn't in the place you expect it to be. For example the commands to open and close a window are in the group called 'Select . . .' — there is no group called 'Windows' which would have seemed obvious. And the report-printing commands are scattered between the 'Print . . .' and 'Select . . .' sections.

As there is no way that a command can be typed in — it must be clicked on — there is no way you can make a syntax error (as opposed to a logical error caused by placing the commands in an incorrect or nonsensical order.) But, conversely, there is no way to enter the command line you want directly. The reason is that the command lines don't exist as text, but as pointers to the routines in Quartz. The other consequence is that sequences cannot be created in a text editor and imported as ASCII files. You may work out the structure of an application on your word processor, but you will have to click your way through the lists to enter it up.

Entry layouts consist of one or more windows containing fields, buttons and lists. There are four window types available, from the simple window used for warning messages to the ornate with a title bar containing a combination of fixed information such as a heading, and possibly variable information such as the date, or the user's name or some other locally calculated information. At any one time, a main data file must be specified, and it is only records in this file that can be edited. Data from connected files can only be displayed. However, it is a simple matter to change the main data file upon some user action such as clicking a button.

To place a field on a layout, you double-click where you want its first character. This opens up another window where there are choices for field type, name, calculations and range checks. Fields on one layout can be from any number of different file formats, and fields from connected files can be specified as auto-find. When data is entered into such a field, Quartz will fetch the matching record — assuming the field is an index one. Thereafter, any data from that record can be displayed automatically.

The size of the data displayed can be set independently of the actual file format, though this does not affect the file format itself and data is subject to the constraints of the original format. A character field can be up to 2400 characters long, and will automatically word-wrap within a rectangle specified as part of the entry layout. If the rectangle is smaller than the text, the use of the mouse or cursor keys will scroll the text within the rectangle. This is a great improvement over the memo fields of dBaseIII.

If a list is chosen as the field type, then you can determine the format of each line in the list, adding text or other variables to the fields that were used to build the list. List boxes can be sized on the layout, and can be as small as just one line. The sequences attached to the entry layout determine the consequences of double-clicking on a list line, but could be used to establish a link with a record in a connected file.

Cut and paste and drag options allow for the tasteful or ergonomic layout of the entry form, and seven different rectangle types can be used to group together related fields. Any field or box can be coloured, though strangely, text entered onto the layout window itself, such as field descriptions, must be black.

A check box associated with a particular field returns a value of 1 or 0 depending on whether it is checked or not. While there is text associated with the box — for example, 'IN STOCK' — this text is not passed to the current record; only the number is. This seems a pity as a constant translation between number and text has to take place. In practice, you would probably store the data as numbers, but it means that whenever the field is used, the same translation has to be done.

The same is true for radio buttons. In our video store application we used a set of radio buttons for tape format — VHS, Beta or Video 8. Radio buttons are useful when the number of options

is fixed for all time, so to speak. If the choices were changing, a list would have been better, with the tape formats stored in a data file of their own and the list created each time the application was run or a format-editing layout used.

The three buttons we used were all linked to the same field. During data entry, Quartz returns a number which specifies the location of the radio button which has been pressed: thus VHS would return a '0', Beta a '1' and Video 8 a '2'. While it might have been better if the associated text had been stored in the record, Blyth argues that this causes difficulty when the record is called from the file for editing. Quartz has to show one of the radio buttons as being selected and would have to evaluate the text on the screen to choose a button. Using numbers, if the field in a record has a value of 1, then Quartz checks the second button in the group.

Push-buttons, as has been mentioned before, can be used to invoke standard record management functions like edit, insert, find, next, and so on, or they can be customised to call any of the sequences contained in the menu formats. The text on the buttons and their size can be changed, though the buttons can only be stretched horizontally and not vertically. Buttons can be designed to disappear during data entry or when there is no current record. Therefore, the 'Edit' button could be hidden while there is no current record, and the buttons to move through the records need not be seen while the user is editing a record. The text which is displayed on a push-button can be variable and can be changed as the user progresses through an application.

Quartz provides a range of system variables, but no user-defined ones except as fields in a file format. There are 60 numeric variables, five string variables, and others representing the system date and time, the state of a logical 'flag', the current workstation number on a multi-user system, attributes of the current list, and the status of various aspects of the data entry process currently taking place.

There is no way that names can be assigned to the variables, which is a pity. A formula #6=(#3-#2)*#4 makes a lot less sense than RENTAL=(DATEIN-DATEOUT)*DAYRATE, and variable names could be assigned dynamically through sequence commands.

All of these variables can be displayed onscreen and manipulated under sequence control. To include

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them in a calculation or layout, they are selected from the file format list which is always invoked by pressing F10. Again, in keeping with the click approach, calculations can be built up by clicking on the variables and field names in the lists popped up by Quartz. If, on checking, an invalid variable or field name has been entered by hand, it is highlighted and the options presented for clicking into place.

While building a Quartz application, shortcut keys can be used to activate certain functions. Thus Control-M will bring up an editing window for the current menu; Control-W will toggle between editing the current layout and using it; and Control-R will allow you to edit the current report, with the same key being used to start it printing.

Such shortcuts can also be assigned to menu lines, so we assigned Control-N to the 'Add a new member' option, and Control-V to the 'Add a new video' line. For frequently used choices, such shortcuts would speed up a user's operation considerably.

Reports are designed by painting a screen. Each report consists at a minimum of a detail section which is repeated for as many records as satisfy the search criteria, if any, in force at the time. Additionally, headers and footers, sub-totals and sub-total headings are available.

Any item on a report, be it a field or fixed text, can be assigned a font, font size and style such as bold or underlined. Quartz printer handling is determined by Windows and, annoyingly, we had to run Windows' Control program to change printers.

Quartz was run with an Epson LQ800 24-pin dot matrix printer and a Kyocera 1010 laser printer. Using the Epson, Quartz insisted on printing in graphics mode, which would be very time-consuming except for the most elaborate but short report. Long reports containing much data need to use a printer's fastest draft mode, but the only way to use this is to change the default Windows printer to a text-only device, in which case we lost the box rules.

When a snazzy, stylish report was required, Quartz turned out some good work with the different fonts and sizes reproducing well. The penalty is speed, but that is a problem for printer manufacturers, not database designers.

On the Kyocera speed was less of a problem, though even there it would have been useful to be able to turn off the fancy fonts and run off a quick draft without relying on Windows' ability to run two programs at once and invoke the Control program.

Quartz vs dBaseIII

(the 'biased' views of a dBaseIII user)

It took me approximately three months of sporadic working, from knowing nothing to developing the basic structure of a working application using dBaseIII. The video shop system we developed under Quartz, although somewhat less complex, took around a week to get into a similar semi-operational state. At first sight this twelve-fold increase in speed seems nothing more than amazing, but then I started to reflect on the process of database creation under Quartz.

Quartz is incredibly easy to use because everything is interactive: creating a procedure under Quartz consists of literally pointing at the statement you want and then pointing at the arguments you want to use with it. This is great fun and a very quick way to create procedures or 'sequences', as Blyth calls them. It's also a very dangerous way of performing any kind of programming — it tempts you into making hasty alterations without considering their repercussions. It is very difficult to sit down and write all the sequences on paper in true top-down fashion.

The majority of programmers spend their time maintaining the source code of existing programs, and my experience suggests that the same is true for database designers. A large Quartz program could be many times more difficult to maintain than its equivalent in dBaseIII; not only because of the problems generated by its interactive nature, but also because of other problems. When the sequences are printed, they are printed purely sequentially and so cannot reflect the structure of the overall system; it isn't possible to give meaningful names to variables; and there is no way to build up a library of general-purpose routines (although I am told that an additional Quartz toolkit will make this possible).

Despite these reservations, there is no doubt that Quartz is an immensely powerful package capable of creating applications that are many times more friendly than anything created with dBaseIII. All the power of Windows is fully utilised, for example: creation of entry forms, producing reports and utilising pull-down menus are all exceedingly easy. There were

times during the course of this review when I could have cried, as a feature that took me weeks to create under dBaseIII took less than five minutes using Quartz.

The most difficult concept for a dBaseIII programmer to get used to with Quartz is that of sequences, and the fact that they are hidden away among Windows' pull-down menus. I still find it peculiar to have to examine the depths of a menu in order to find a system's source code. Once you accept that sequences are roughly equivalent to subroutines in dBaseIII, things become somewhat easier. But even then the process of converting a dBaseIII program would not be a simple line-by-line translation, because so many of the features of Quartz are tied up in interactive set-up screens. Building a Quartz application involves creating all the components of the system (input forms, menus, reports, and so on) and glueing them together with sequences. dBaseIII applications are created from the ground up, as in the source code (discounting The Assistant, Ashton-Tate's rather feeble attempt at a friendly application development environment).

I was expecting one of the trade-offs of the Quartz environment to have been speed. Surely, as Quartz has Windows to support, it would be abysmally slow in comparison with dBaseIII. When developing applications this is definitely true — running Quartz on anything less than an AT is painful, but when running an application the difference is less noticeable.

My initial (non-scientific) experiments suggest that dBaseIII is the quicker of the two programs but not by much. Of course, dBaseIII developers have one major advantage in the search for speed — for extra cost they can purchase a dBaseIII compiler.

Will I be using Quartz for my own applications? Not right away, no, but I suspect that when the pressure is on and I need a prototype up and running within a week, that I might succumb. Eventually the superior quality of an application generated under Quartz will decide for me, providing of course that the hefty \$1500 price tag is within my budget.

Nick Walker

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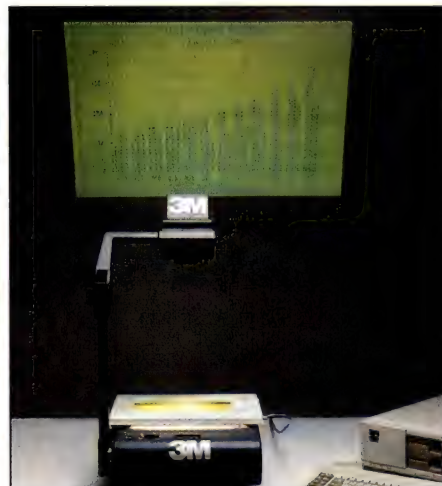


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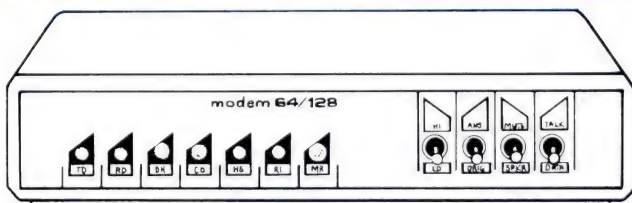
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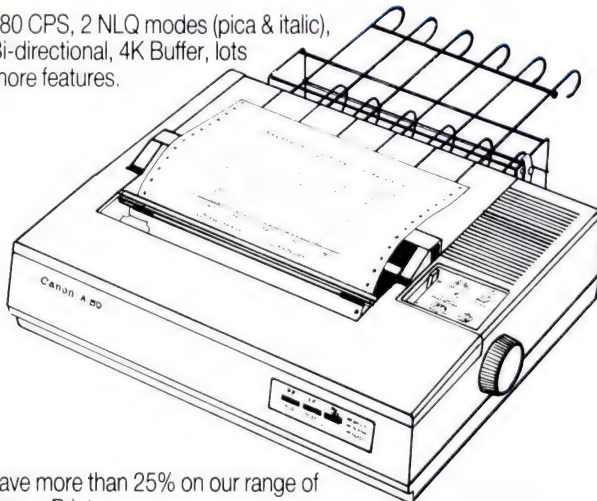


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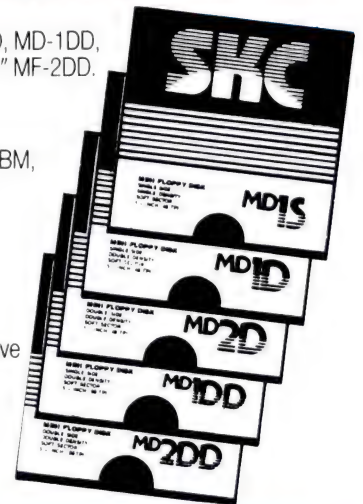
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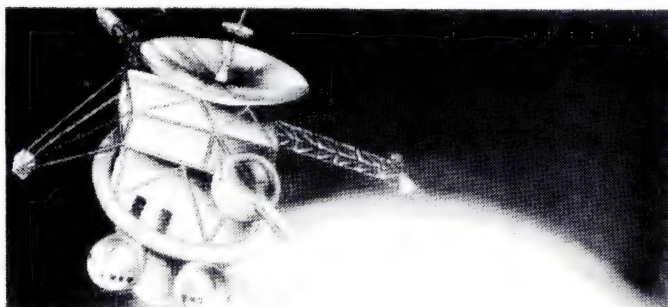
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SCREENTEST

Additional features available include an import and export facility using industry-standard formats such as DBF, SYLK and WKS.

Documentation

We worked with a pre-production version of Quartz and the documentation was not finished. However, we did have a fairly complete reference guide and this included a brief description of the function of every command and option, often with brief command listings.

The retail version will include an introductory tutorial manual and an advanced programmer's manual. This will include sections on database development and design. A quick reference guide will be in loose-leaf format so that updates can be easily inserted.

Quartz will also be supplied with a full sample application of a project management system. This will manage files of people and tasks.

Price

Omnis Quartz will retail at approximately \$1500. Blyth has decided not to include Microsoft Windows with the pack-

age on the basis that an increasing number of manufacturers are bundling Windows with *their* machines. This decision is questionable, and if you don't have Microsoft Windows it will set your back an extra \$256.

Blyth will be marketing run-time modules for Quartz at around \$350 each, and a full multi-user version will be available later this year, although existing applications will need minimal or no modification to run multi-user.

Conclusion

This review has only provided a taste of what Quartz can do. There is no doubt that it is an extremely powerful programmable database, both in its data-handling capabilities and in the tools it gives the programmer to design applications.

The point and click approach of Quartz to programming, and the use of menu lines rather than separate program files to store sequences, will seem strange to most existing programmers. But when the habit has been acquired, it is possible to set up the bones of a slick-looking application very quickly.

Quartz doesn't lend itself easily to a

top-down approach to database design either. Ideally you would start with the visible pull-down menus. But, having designed the file formats, lists and entry layouts, you have to go back to the menus to do the nitty-gritty work of programming. Fortunately it is easy to hot-key between the layouts and the menus, but the process does seem rather circuitous.

Finally, you have to question whether a graphics environment is ideally suited to all data applications. Certainly the screens can be designed well, and push-buttons and scroll bars can prevent users from making mistakes. But in a heavy-duty data entry system, an operator doesn't want to have to keep taking his or her hand off the keyboard to use the mouse, and greater opportunity to design in hot keys would be essential in this situation. Nonetheless, these are small criticisms compared to the power and ease of use of the finished applications.

END

Omnis Quartz is due for release in November from Busiware. Tel: (02) 281 1300.



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Kurzweil Discover

The Discover 7320 text and graphics scanner from Xerox subsidiary, Kurzweil, 'learns' typefaces as it goes, and incorporates templates and dictionary to improve its pattern-matching performance. David Tebbutt describes the workings of this impressive, 'intelligent' product.

A scanner which teaches itself to recognise most text fonts has got to be worth investigating, even if it does cost \$23,900. Unlike other text-recognition scanners, Kurzweil's Discover doesn't hold images of a series of fonts in its memory. Instead, it applies rules relating to the general appearance of letters and uses dictionaries, both embedded and user-defined, to try to make sense of what it's reading.

Again, unlike other scanners, this approach gives Discover the ability to read proportionally spaced text. Where it falls down is that it cannot read draft dot-matrix characters, because the lines and curves of the letters are not continuous.

Discover also handles graphics, producing files in PCX, TIFF and RES formats. These graphic images may be captured as straight black and white — fine for line art — or as continuous tones, for photographs and the like. These tones are encoded in 'dithered' form where the sixteen levels of grey are represented by either random or spiral patterns of dots.

Textual information is encoded according to either IBM's Document Content Architecture (DCA) format or in an ASCII-based, user-defined format. This means that the output files can be read by any word processor and, if a user-defined format is used, will contain control character sequences pertinent to that program. These sequences look after such things as the treatment of tabs, indents, line centring, paragraph ends and page breaks.

System & set-up

The Discover system comprises a scanner, a PC-compatible plug-in board, a connecting cable and the Discover



software. The scanner is a badged Ricoh SS30 which feeds sheets (up to ten) from a hopper on top, out through a slot in the bottom front edge. This gives the machine the advantages of multiple document handling but the disadvantage of not being able to handle books and periodicals unless they are sliced up.

The processor card is driven by a 68020 processor, controlled by a custom logic array, and carries its own

2Mbytes of memory. An optional 2Mbytes, for faster throughput, may be added as a 'piggy-back' at the non-slot end of the card. The slot end is already taken up with its own piggy-back card containing the scanner logic. This suggests that other, more sophisticated scanners might be in the offing.

Kurzweil has covered the outside face of the piggy-back card with a mylar panel, which is just as well since it only

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just squeezes in between neighbouring cards.

The nice thing about this single-slot approach is that Discover can scan documents in background mode since all its processing is done on the card, independent of the PC and its bus. Within limits (no resident programs) you may run DOS applications or other parts of the Discover software suite while scanning and analysing your document.

Hooking the system up is so easy that it doesn't warrant description, and installing the 1Mbyte of software is simply a case of copying it to your hard disk.

Discover software

The Discover software looks crude at first glance but turns out to be a gem to use. Kurzweil has used the Lotus menu bar approach and then added what I'd call 'route maps and signposts'. This way, you always know where you are among its 150-odd options. Because the screen's only job is to control the Discover hardware and software, it can be dedicated to displaying the options available and how to access them, even if they're not part of the current menu bar. Most programs are forced to compromise between putting user information on the screen (words, graphics, numbers and so on) and giving operating guidance.

Discover lists in the body of the screen, all the things you might want to access while in a particular section of the program. Thus, if you choose the 'Settings' option within 'Text scanning', the screen will list 'Contrast', 'Units of Measure', 'Page Height', and so on (see the box for a full list). Alongside each entry is the name of the key you have to press to get nearer to that option.

Similarly, alongside Page Height will be the letter 'P' which selects the 'Page' option from the menu bar. Having pressed this, the menu bar changes and the letter alongside the option will change to 'H' for 'Height'. If you find yourself down the wrong branch of the program, an up arrow alongside the option tells you to press <ESC> to go back up. As you move from level to level and branch to branch, a display on the top line shows the path you followed to get to the current option. For example, when you reach Page Height this path will read:

Main—>Scan—>Text—>Settings—>Page

This combination of route map and signposts makes Kurzweil's Discover

Text scanning settings

Main—>Scan—>Text—>Settings

Scanner contrast
Units of measure
Page height
Page width
Next page number
Page number increment
Assurance level
User lexicon
Language
Lexical context
Text type
Scanning window

Graphics scanning settings

Main—>Scan—>Graphics—>Settings

Graphics file name
Graphics file extension
Scanner contrast
Units of measure
Page height
Page width
Scanning window
Graphics resolution
Tones
Output format

Conversion settings

Main—>Convert—>KCP—>Detailed settings

Vertical space
Horizontal space
Horizontal tab
Decimal tab
Centre begin
Centre end
Block indent begin
Block indent end
Questionable characters
Illegible characters
End-of-line hyphens
Underline begin
Underline end
Soft page end
Hard page end
End of line
End of paragraph
Beginning mark-up
Ending mark-up
Prefix file name
Suffix file name

one of the easiest programs I have ever come across.

Scanning

Whether scanning text or graphics, you have to input the page measurement and, if appropriate, the window within the page you wish to scan. The window facility can be a great time-saver when scanning graphics because Discover won't waste time scanning outside the window. But when you're trying to scan a page of a magazine, it can be a real pain. You have to describe the position of each rectangular area of text or graphics before scanning it — one rectangle per scan. The Newsprint section in APC, for example, changes from page to page, which means a lot of measuring and reloading the document. Not to put too fine a point on it, this can be very tedious.

Minor gripes apart, though, scanning is a breeze. You simply feed the document into the scanner and press 'Go'.

If you're scanning graphics, a file of the page or window is created in one of the three formats. You may set the resolution of the scan to 180, 200, 240 or 300 dots per inch. Dithering is a function of the Ricoh scanner and works just fine. I scanned some photos of my children and found that the spiral dither worked best.

Text scanning is similarly straightforward once the windows have been defined. Unlike graphics, a multipaged document may be scanned and, assuming single-column text, you may stack double-sided pages and teach Discover to collate pages read into a correctly sequenced file. This is done by making the page increment '+2' on pass one, then turning the stack over and making the increment '-2' on pass two.

You may vary the level of assurance you find acceptable, and also the way in which the system will flag characters it is unsure of. A 'highlight the next character' sequence is ideal, though you have to experiment to find the right balance between Discover being overconfident and unduly nervous.

You may give the name of one of your own dictionaries; so, for example, if you were to scan names and addresses, you might find it helpful to use a town and country name list. If you are reading unintelligible text, it would help to feed a page or two of normal words first so that Discover can get the hang of the typeface before starting real work. Although Discover theoretically treats each document as a brand new challenge, you can fool it into remem-

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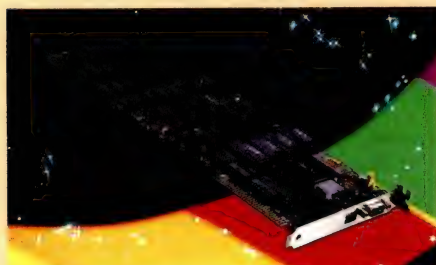
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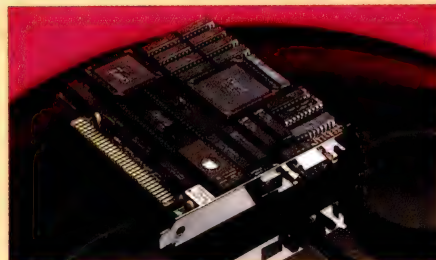
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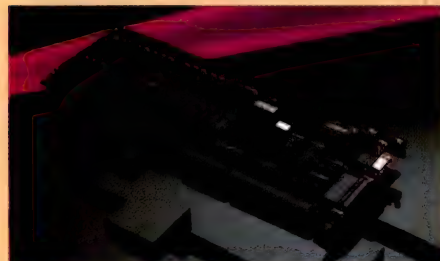
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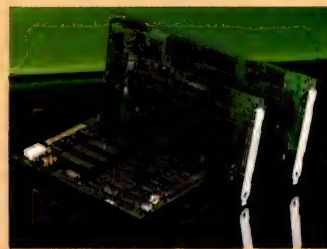
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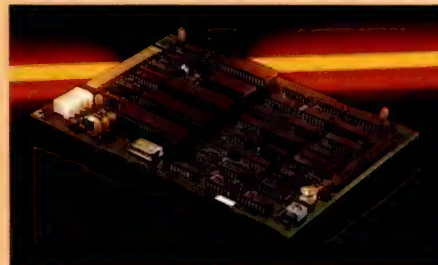
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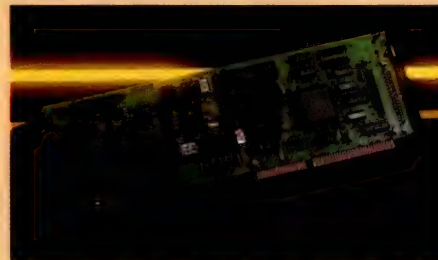
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How the Kurzweil Discover works

The most intriguing aspect of Discover is its intelligent character recognition (ICR) system. How on earth does it learn to understand text without any help from the operator?

Firstly, it tries to break the scanned text up into lumps that look like lines, or parts of lines, of text. This can be likened to your standing a few feet away from a document — you can easily see which bits are text lines and which are pictures.

When Discover has stripped out the graphics and general noise from the document, it focuses on the text lines and strips away obvious clutter such as underlines and boxes around the text. In the case of the underline, this information is stored with other details of the current text fragment.

Now Discover analyses the fragments to find word breaks and parcels them into word-like objects called clusters. These tend to be the most active structures in Discover. A cluster manager keeps sending them off for analysis until it finally discovers what they are.

The cluster manager has access to a number of recognition experts, each of which is able to return information about the cluster. When the cluster manager has a number of opinions, it calls on a team of resolvers to help choose between the guesses of the various experts.

The main expert is a topological, or geometric, recogniser. This looks for the number, position and size of loops, identifies concavities, convexities, whether a perimeter reaches certain points in the image, and assesses symmetry. Most of this work is organised as trees of experiments.

One of the key tasks is to identify the baseline. When one or two characters in a word have been recognised, the baseline becomes obvious and greatly simplifies the recognition of other characters.

The trickiest things to recognise are broken and touching characters. A fragmentation expert has to figure out what the broken character is closest to in the one case, and decide where to split characters in the other. Some of the results can be quite bizarre.

The 'P' in Prolog, for example, came out as 'l' followed by an apostrophe when I scanned an APC page. Common ligatures, where two letters are always joined in typesetting, are easily handled because Discover is programmed to expect them.

Ambiguities are handled by the resolvers. For example, it is darned difficult for Discover to differentiate between 'e', 'c' and 'o'. Some 'e's, for example don't have closed loops. This is where statistical information about letter frequencies and common sequences come into play.

When the lexical resolver is given a 'word', it looks it up in the dictionary and passes the result up to the main resolver. A successful match will then spread the good news around, reinforcing the shape recognition expertise of the program.

But, if the lexical resolver fails to find a match, the main resolver will try other, less likely, possibilities. If it still draws a blank, it might decide to change decisions made by lower-level experts. For example it may decide that word breaks should be altered, either by merging two 'words' into one, or by splitting one into two.

As you can see, the whole process is recursive and, as each new piece of information is discovered, old unresolved clusters are re-examined until, hopefully, the whole page makes sense. Discover does this analysis on a page by page basis, accumulating its findings for the duration of a document.

You can, however, fool Discover into remembering information between documents by 'interrupting' work on a document. This creates three temporary disk files: one contains the page format analysis; another contains the parameters set by the user; and the third contains the important stuff — the character descriptions discovered so far. Judicious deleting and renaming of files enables you to use them on a new document but, since it usually only takes half a page or so to train Discover, you would need a special reason for doing it.

Discover knows the difference between numbers and letters and will arrange numbers into columns if ap-

propriate. It also knows that '1st', for example, is acceptable and doesn't try to turn it into 'lst'. This means that it will also accept '2st' which perhaps isn't so smart. When scanning mixtures of numbers and letters it can sometimes have problems with 'l' and 'i'. January i makes more sense to Discover than January 1, for example, though it should know not to accept the word 'i'.

Recognising words is only part of the Discover story, though. The program also analyses the layout of the page so that it can approximate this layout in the output document. To keep track of the page, Discover maintains a network of paragraph hypotheses. For example, an end of paragraph after the second line leads to an expectation of an end of paragraph after the fourth or fifth line. As the analysis proceeds, it uses earlier discoveries to help it decide the likelihood of its new hypotheses.

The system is far from foolproof. The text in one ordinary letter I scanned had an exceedingly ragged right edge. Discover decided that the first line actually constituted a paragraph and tucked a double-line feed at the end. The program then had a high expectation that each line was a paragraph, so the actual paragraph it was analysing ended up double-spaced.

The system already has the logic necessary to make it interface well with desktop publishing systems. Because it can recognise indents and vertical spacing, it clearly has the potential to help build DTP style sheets. But, since Discover works on general character shapes, it is unlikely to help much when it comes to identifying fonts or distinguishing between bold and normal type.

Don't get the wrong idea: Discover is clever and useful, and, by fiddling with the user parameters, you can get it to produce quite good results. I think we can expect to see regular improvements to the product, though, especially in the areas of text formatting, DTP interfaces and the ability to scan existing graphic image files for textual content.

bering what it has learnt and applying this knowledge to any subsequent documents.

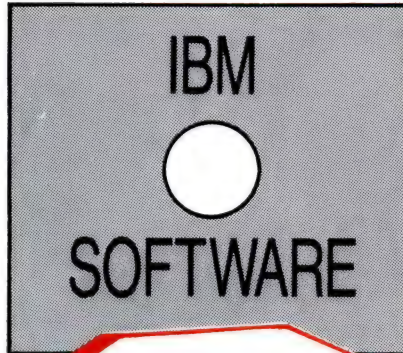
As well as trying to read the words on

the page, Discover also attempts to assess page layout and embed the appropriate format codes in the text. It doesn't always work — I ended up with

some quite exotic line spacing and tabs at times. It was a great improvement on getting a string of continuous text, though. Tabs, especially, can be a

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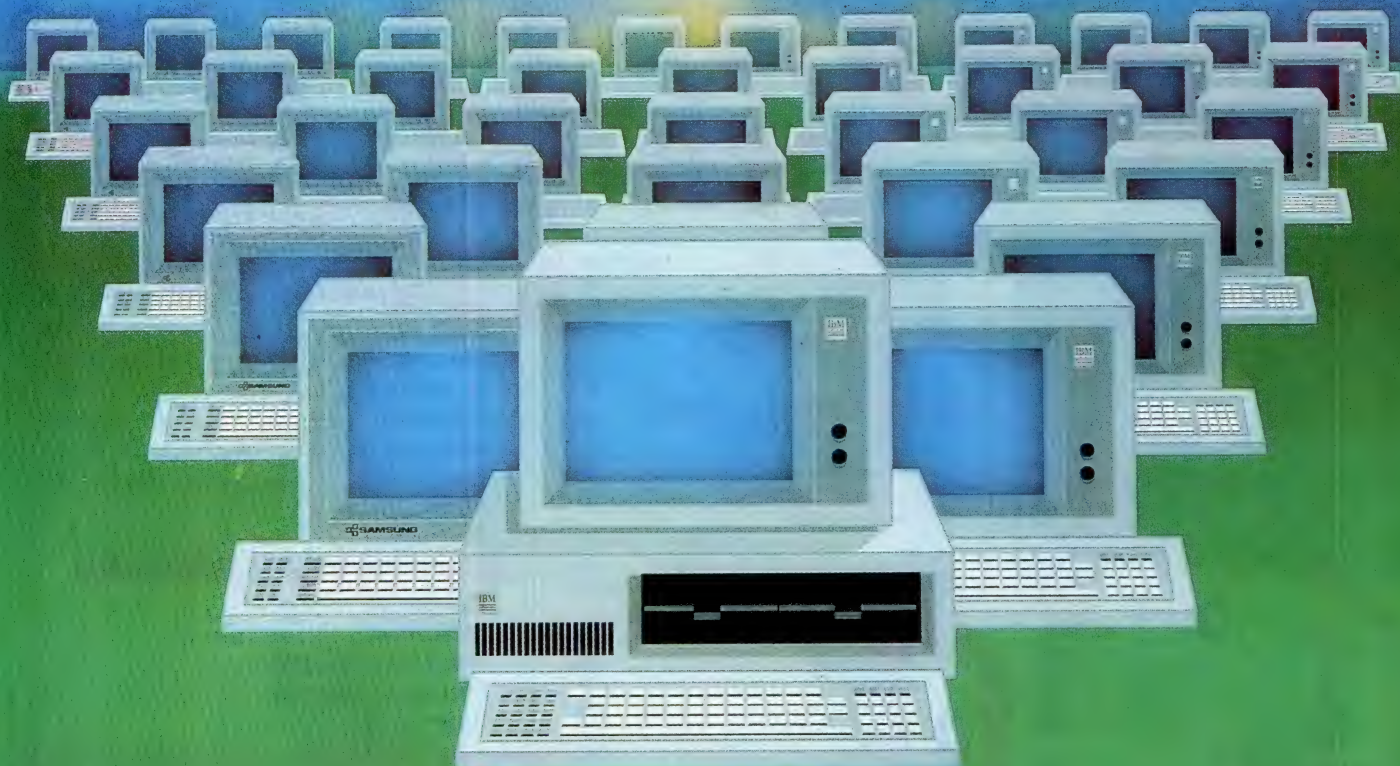


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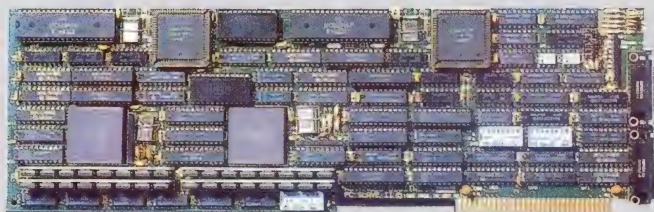
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nightmare because Discover hasn't a clue where they will be set on the target word processor.

Conversion

When Discover has finished reading a document, you have to convert it into DCA or your own defined format by running it through the associated CONVERT program. One of the nice things about Discover is that you can do this while processing the next document on what Kurzweil calls its Lamprey board. (Lamprey, incidentally, was the code name cooked up by the development team. They wanted to use the name of an animal which formed a symbiotic relationship with another. Too late, the team found out that a Lamprey eventually kills the fish on which it is a parasite.)

Once converted, you can access your word processor, a further conversion program (DCA to something else, perhaps) or a comms program directly from the Discover menus. It will automatically pick up the last file converted for further processing. You may also use a 'back door' to DOS, but don't try to load resident programs because you might not get back again.

I had problems with some resident programs but SideKick seemed to hold up all right provided I loaded it first. Kurzweil seemed doubtful when I mentioned this so I'd suggest you take great care. Again, processing can take place on the Lamprey board while you are performing any of these activities.

Finally, you can run Discover from a command line in DOS by providing a document name and, optionally, the name of the parameter file you wish to use. In the event of a paper jam or other mechanical problem, jobs can be restarted from the current DOS application by pressing a hot-key combination.

Conclusion

At a price of \$23,900 (2Mbytes system) and a 16 month maintenance agreement for \$2380 (2Mbytes system) or \$2720 (4Mbytes system), this machine has been priced beyond the reach of most single PC users. It is targeted at those work groups who can't justify the \$59,000 needed for big brother, the Kurzweil 4000.

The scanner scores over flat-beds and the DEST because it can read up to ten pages at a time, but it loses

points because it can't handle books and magazines. Discover scores over conventional OCR systems because it isn't limited to a rigid set of typefaces but can learn most things you give it in reasonable time, and can handle proportionally spaced text. On the other hand, it can't read draft dot matrix material.

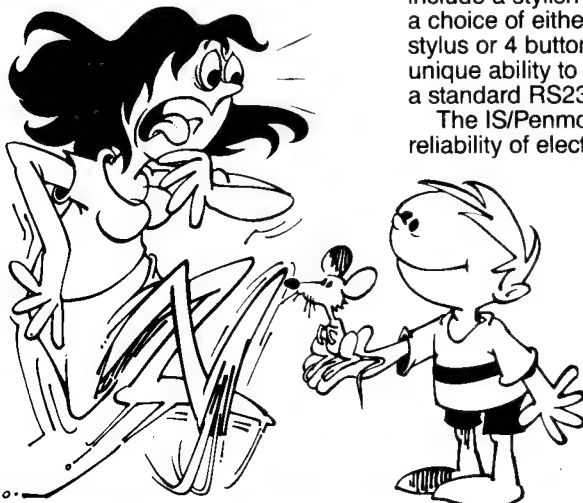
My guess is that the most likely buyers are going to be those who need to share the device in a work group which requires relatively straightforward data capture from single-column typeset material. Those who can tolerate a high degree of operator intervention might consider using it for more complex work.

My view on the price is that if it's the only machine that can do your job, then you don't have a lot of choice. And if, as I suspect, the sales volume is going to be quite low, then Kurzweil would be mad to pitch it at the kind of price more common in the PC market place.

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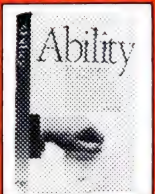
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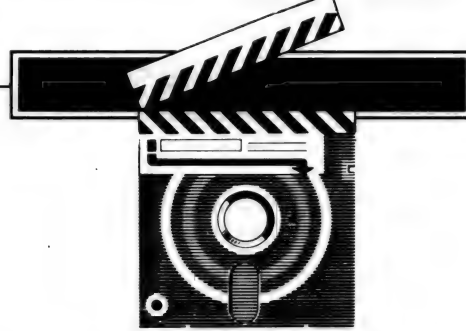
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XPress

Described as a truly professional, if pricey, page make-up system for the Mac, XPress from the US company Quark Incorporated offers unprecedented typographic control over page layout, and has set a new standard for desktop publishing software. Graham Jones gives his verdict.

When the vogue for desktop publishing really began to take off last year, one program stood head and shoulders above the rest as the 'Rolls-Royce'. That program was PageMaker, from Aldus, and it was used as a yardstick by developers hoping to gain a slice of the rapidly expanding desktop publishing market.

However, PageMaker has some limitations, especially for professional users who have become increasingly frustrated by them, and by the slowness of Aldus in introducing upgrades. Enter Quark, a US company, with a new desktop publishing package called XPress (distributed here by PICA).

New standards

Quite simply, XPress is the best desktop publishing package available for the Macintosh. It outshines the old yardstick of PageMaker — even the new version — and sets new standards of its own.

There are two main advantages to XPress. Firstly, it has a degree of typographical control which is so fine that it will allow you to alter the spacing of type to within 0.00014 of an inch, or 1/100th of a point — that is, one fifth of a dot even on a 1270 dots-per-inch typesetting machine! Secondly, XPress allows you to wrap text

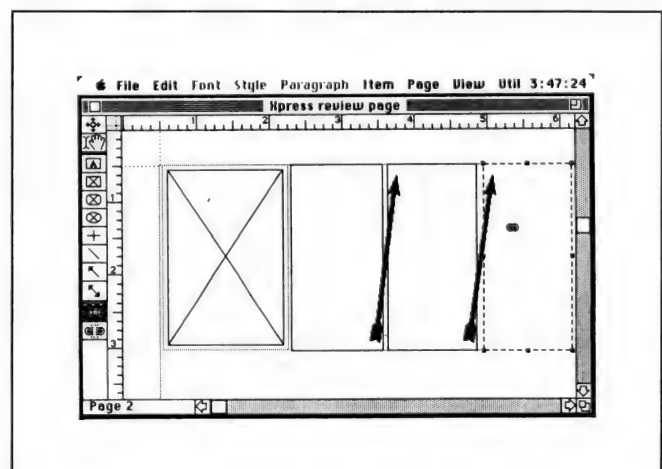
around complicated graphics simply, efficiently, and quickly. To date this has only been possible on the Macintosh with extreme difficulty using PageMaker, or by programming in PostScript.

XPress has a number of advantages over PageMaker and another page make-up program, Ready, Set, Go! 3; it combines the best of both of these and provides a truly professional page make-up package.

The program comes on three disks. One contains the application itself, a second has the system folder and a few examples of XPress documents on it, while the third disk contains two



Pages in XPress can be viewed in a variety of sizes. The toolbox always appears on the left of the work area, and is not movable. Rulers can be in a variety of units and can be removed if not required



The three text boxes are linked (shown by the onscreen arrows) by using the chaining tool, highlighted bottom left in the tool palette. Other tools allow picture boxes to be drawn, and lines and arrows to be positioned

utilities to allow the program to be copied to floppies or to a hard disk. (To run the program efficiently a hard disk is necessary.) The program is copy-protected, but you are allowed to make up to three copies for personal use. Also included with the program is a utility called 'Frame Editor' which allows users to construct borders to surround pages, text, or illustrations.

In use

Once the program has been loaded you have the usual option to open up an existing document, or start a new publication. When choosing a new document from the 'File' menu a dialogue box asks you to decide on the size of the page, the number of columns, and margins, and so on. The page can be any size from three inches square to a poster-sized 36 inches by 36 inches.

Once you have decided on your basic page size you can open up the first page. However, you do need to enter the paper size in the 'Page Set Up' dialogue box before printing anything you work on. This is an annoying little problem with some Mac programs. Why the paper size cannot be included in the new document dialogue box is a mystery!

Nevertheless, the Page Set Up dialogue box does contain quite a bit of information, and even allows users to determine the grey level, in lines per inch, of PostScript laser printers such as the Apple LaserWriter. By adjusting this value you can get improved grey tones. The default is 60 lines per inch, which in my view is too low. A value of 80 or greater achieves much better grey resolution on the LaserWriter and avoids the coarse-looking tints of other desktop publishing programs.

Once the page has been set up as you want it, you can set to work. The document always opens at the top left of the first page — no matter where you stopped working. This is not too much of a problem since travelling around the pages is fast and efficient.

Page design

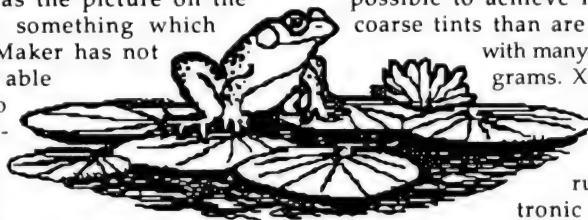
XPress, unlike PageMaker, asks you to define areas of text or graphics prior to entering any copy onto the page. This is similar to Ready, Set, Go! 3 and, at first sight, has always seemed to me to be an unnecessary additional step which PageMaker cleverly avoids. However, it does provide a much greater degree of design flexibility, allowing you to simply move items

XPress — the best page make-up package for the Mac?

Xpress enables you to perform a number of tricks which are not easily possible with the most popular Macintosh page layout program, PageMaker.

It is very easy to make text run around irregularly shaped objects such as the picture on the right, something which PageMaker has not been able

to do without a lot of effort.



The next version of PageMaker should be able to do this, but the US version I have seen does not cope with such sophistication, and by the end of June the update had still not been made available, despite months of speculation.

Running text around complicated

graphics is not the only advantage of XPress when compared to PageMaker. XPress also possesses a unique feature in its ability to be able to control the grey levels of PostScript printers such as the LaserWriter. This means that it is possible to achieve much less coarse tints than are available with many other programs. XPress also

includes a printer driver to run a Linotype machine or a Data Products laser printer. It is highly likely that XPress will find widespread use as a front end typesetting solution in many graphics orientated publishing houses.

XPress provides a much greater degree of typographic control which is necessary in such situations.

Frame editor allows design flexibility

The XPress package also includes a program called 'Frame Editor'. This is a utility which allows you to design and modify borders for text, pages, and pictures, just like the one around this page.

Most of the examples included with the XPress package are pretty horrible, including this one!

But the Frame Editor utility does allow you the flexibility to produce

your own borders from any kind of graphics you care to import.

Such a system is not available with other leading page make-up programs for the Mac, such as Ready, Set, Go! 3 or PageMaker 2.0.

Fancy frames are not widely used in publishing, but there will always be a day when producing something and a frame editor will be required.

Another simple utility provided within the

XPress package is the ability to truly change the horizontal scaling of fonts.

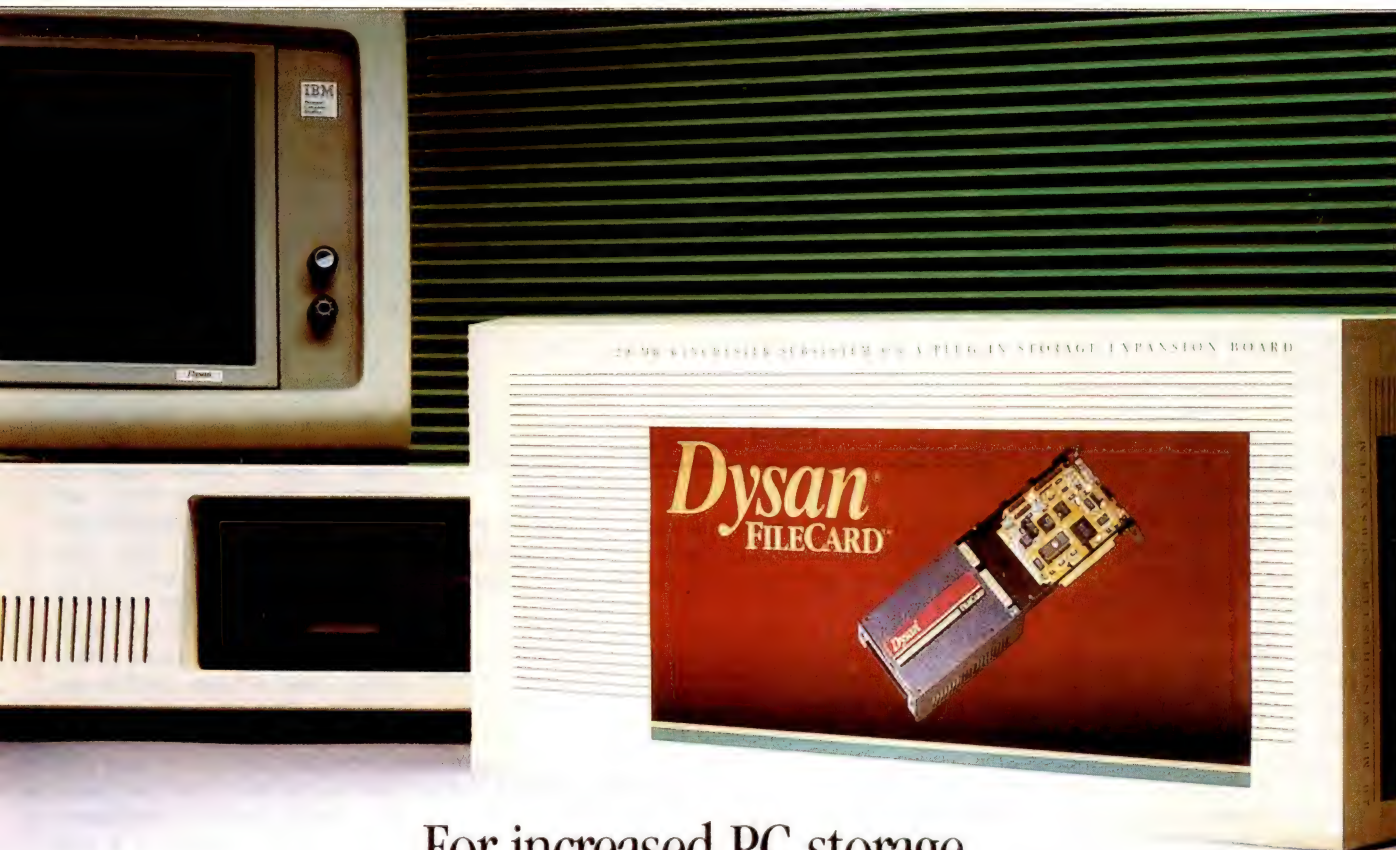
So it is possible to stretch type to achieve some pretty unusual effects, some of which will, nevertheless, have a use, especially in magazine work.

Graham Jones

around the page to redesign any aspects you don't like.

You can define text boxes, or three

types of picture boxes in XPress. Each text box can be altered by using the 'modify' command from the 'Item'



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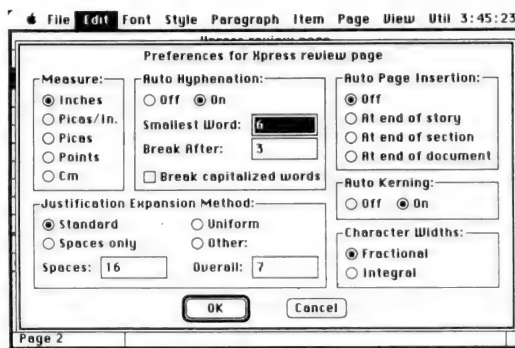
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menu. This allows precision control over the position of the text box, allowing you to move it around the page if you have not drawn it exactly where required. You can change text box positions to within an accuracy of 1/1000th of a point! The modify dialogue box also allows you to specify the number of columns in a text box, alter the gutter (space) between them, and to request the 'text offset' — the space between the outer edges of the columns and the start of the text. This is very useful if the text has a rule around it, thus ensuring that there is a space between.

You can also make text boxes transparent by using the modify command. This means that you can place other text or illustrations behind these boxes and they will be seen through the text. The default is for opaque text boxes. Should any other material, such as a picture box, be included inside, then the text runs around this. Text boxes can also be chained together so the text will flow automatically from one to another. This is a very useful facility, especially in magazine work where text may be split between pages which are a long way apart.

The three types of picture boxes available are those which are rectangular, oval, or rectangular with rounded corners. Pictures can be included



Setting up a page in XPress allows you to decide the system of measurements you use; whether hyphenation will happen, and if so, how; the method of justifying lines of type; whether kerning will occur; how character widths are calculated; and so on

within these boxes from MacPaint, PICT, or Encapsulated PostScript files, such as those created in Illustrator. Like text boxes, picture boxes can be modified for accurate positioning. You can also change the radius of corners for rectangular boxes with rounded corners, and you can decide how far text outside boxes will be offset when it is to run around them. Like text boxes, picture boxes can be transparent. You can also make picture boxes transparent but make the text run around the picture itself.

All boxes, whether for text or graphics, can have background

shades, and you can specify the colour of such shades. This is very useful in professional publishing since XPress will print off each colour item separately, thus allowing you to produce colour separations for litho printing. Incidentally, XPress also provides other useful printing luxuries, such as the ability to produce wrong-reading negative film, thus saving additional cost and time at the printers. The colour option, which also allows you to specify colours for text, will work with colour ImageWriters — though anyone who has bothered to buy XPress will almost certainly never use an ImageWriter. The colour flagging will also be useful when colour laser printers start to appear sometime within the next year.

When you have placed your boxes precisely, flagged them for shades and colour, and so on, you can then place a 'frame' around them if necessary. Basically, an XPress frame is a rule around the box which can be one of a wide variety available, or one you have constructed using the Frame Editor utility. Like everything else, frames can be flagged for colours, and size can be precisely controlled.

Entering text and graphics

With a page designed with boxes for text and pictures, and shades, frames, colours, and so on, having been decided upon, you can begin entering text and graphics. Naturally, you can alter all of the specifications set for the items on the page at any stage in the production of the publication, but it is often useful to set them all initially since this is more professional and it does save time in the long run.

Text can be entered directly in XPress, much faster than in Page-Maker, though it is still slower than standalone word processors. Text can also be imported from the standard Macintosh word processors, MacWrite and Microsoft Word, as well as text only or ASCII files. Before entering text it is a good idea to alter the default settings under the 'Preferences' option of the 'Edit' menu. The default is for no hyphenation, and for no kerning. Considering that XPress allows such a degree of typographic control, to leave these two options switched off seems ridiculous!

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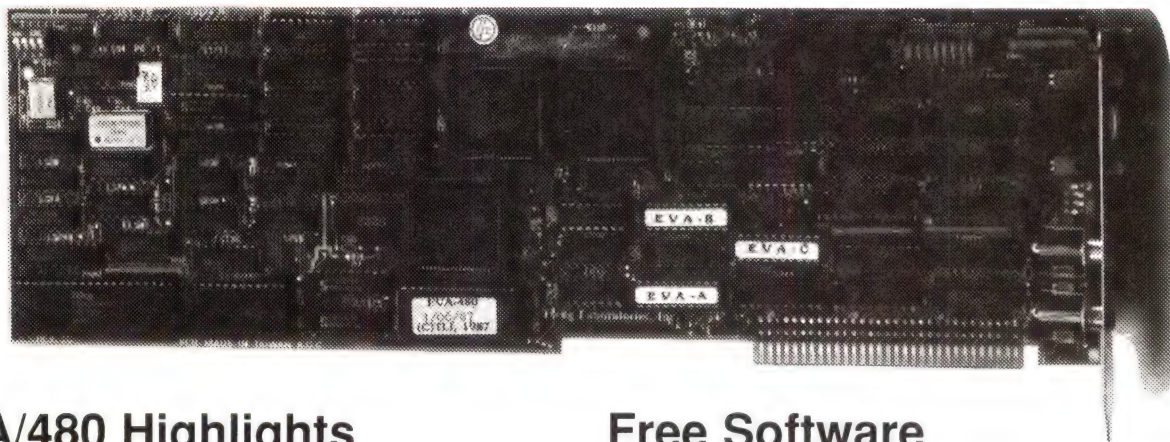


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Hyphenation and kerning can also be manually controlled, even overriding the automatic feature if required. Kerning can be controlled to 1/100th of an em, thus providing control suitable even for high-resolution typesetting machines.

Leading (the spacing between lines of type) can be controlled very finely, and the parameters of each paragraph, such as indenting the first line, and so on, can also be fine tuned. Text can be in any size from the smallest you can read up to 500 points. Cleverly, XPress also allows you to precisely alter the horizontal scale of text. You can compress the text to 25 per cent of its original width, or expand it fourfold.

Pictures in XPress can also be precisely altered in either width or height to within one per cent of their original size. This is a much more accurate method of changing the size of illustrations than allowed for by the manual resizing in PageMaker.

Using XPress is a delight. Features like the horizontal text scale adjustments, the accuracy of positioning items, and the ability to run text around complicated graphics, mean that it places design much more in the hands of the operator who is less at the mercy of the program.

User image

The program is fairly easy to learn, but its range of features means that it demands a few weeks of fairly regular use before you become truly proficient, rather than the few days of less ambitious programs.

Without a doubt, XPress will have given the PageMaker developers at Aldus a few sleepless nights. It is considerably more sophisticated than PageMaker 1.2, and even gives version 2.0 a run for its money. XPress allows precision control over typography which would please even the fussiest typesetter. Consequently, XPress is likely to be the program of choice for professional publishers, and for many

people entering desktop publishing for the first time.

Documentation

The manual is well put together, though it does not cover everything the program is capable of doing, such as the ability to produce well-fitting 'drop caps' (large capital letters) at the beginning of articles.

Price

At \$1600 XPress is a very pricey program; but despite the high price, it is exceptional value. Two years ago such precision control would only have been available in some front-end typesetting solutions, at a cost of around \$15,000.

Conclusion

For anyone involved in desktop publishing on the Macintosh, XPress is well worth investigating, especially if you need to produce material with a great deal of typographical control, or if you want to have the output typeset. It is particularly valuable in magazine design, as well as, say, for advertisement production. XPress has set new, very high, standards for desktop publishing software.

END

XPress from Quark Incorporated is available in Australia from PICA Pty Ltd. Tel: (03) 370 3566. Watch for a head-to-head comparison of XPress and PageMaker in a forthcoming DTP feature — Ed.

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Graham Jones is a freelance journalist and author of The Desktop Publishing Companion (Sigma Press, \$53.85 and available from Jacaranda Wiley. Tel: (02) 816 2758). He uses his Mac and LaserWriter Plus to produce a variety of desktop publications for commercial clients.

basic time

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Data Transfer Rate	250Kbs/second = 1.875Mb/minute		0.65A Typical
	500Kbs/second = 3.750Mb/minute		1.0A Maximum
Tape Speed (Read/Write)	30/60 ips	MTBF	20,000 Hours
Tape Speed (Rewind)	78 ips nominal	MTTR	30 Minutes
Error Rate	Soft Error Read Rate 1 x 10e9	Environmental	Operational
	Hard Error Read Rate 1 x 10e11	Temperature	+5C - +45C
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Constructing an associative memory

*This simple nonlinear neural network runs on your PC.
Bart Kosko explains.*

From the earliest days of behaviourist psychology, scientists have believed that the associative structure of learning resides in the neural microstructure of organisms. But where do memorised patterns reside? Do we encode *Gone with the Wind* in a cell or do we somehow superimpose it on or between several cells? How is the ability to fix a flat tyre or to play the *Moonlight Sonata* stored in memory? How do we learn the colour green from green things, or triangularity from triangles? How do asynchronous neurons keep any pattern, such as a phone number, reverberating in short-term memory long enough for us to learn it?

An associative memory is a mapping from data to data, a mathematical abstraction from the familiar associative structure of human and animal learning. We associate behavioural responses with sensory stimuli, effect with cause, like character with like faces, breakfast with sizzling bacon. An associative memory is parallel distributed — as in a neural network, for example — when it memorises data by superimposing it on the same memory medium.

I will show you how to construct the simplest nonlinear neural-network associative memory — called a BAM (bidirectional associative memory) — that recalls or content-addresses stored associations (x, y) by minimising a system 'energy' (which I will define mathematically later). The BAM is a two-layer feedback network of interconnected neurons. Each neuron a_i in layer or field F_A is totally connected by

'synapses' to every neuron b_j in field F_B , and vice versa, and no neurons are connected within a field. Associations (x, y) are stored by placing them at local energy minima. Input patterns tend to map into the most similar stored association as the input 'rolls' into the nearest energy minimum.

In a BAM, and in most neural networks, patterns are stored in the edges, or synapses, between the neurons. The stable reverberation of patterns across fields of neurons — produced by a BAM energy minimum or other network mechanism — constitutes short-term memory. STM reverberations gradually seep pattern information into long-term memory (LTM), the synapses between the neurons.

Modern computers store everything in single 'cells'. Brains almost certainly do not. Computers learn by rote, not by example. Computers excel at high-speed serial computation but fail at real-time pattern recognition. Brains do the opposite. Computers implement precise algorithms through the synchronous operation of their cells. Brain cells operate asynchronously as a nonalgorithmic dynamic system, which presumably can be approximated with a system of nonlinear difference or differential equations. In short, a computer is a breed of adding machine. A brain is more akin to a market economy, a galactic system, or a swarm of atomic particles.

Now we have hardware devices, called neurocomputers, that behave like brains but look like computers or coprocessors. Neurocomputers are

electrical or optical implementations of neural networks. Neural networks are programmable dynamic systems. Neurocomputers are the engineering by-product of the science of artificial neural systems (ANS), which seeks to explain mind and brain as programmable dynamic systems and rests on the mathematical information-processing principles of neural-network models. Associative memories are fundamental computing structures of ANS and can be naturally implemented on neurocomputers. You can simulate small-scale associative memories, such as BAMs with few neurons, on digital computers with little effort.

The benefits

Associative neurocomputing has two major benefits that underlie the current surge of ANS interest in industry, academia, and government. First, ANS devices can store large numbers of complex patterns — speech templates, visual scenes, robot movements, spatiotemporal behaviour, social behaviour, and so on. Second, ANS devices can classify new patterns to stored patterns quickly. Roughly speaking, neurocomputing devices classify patterns at a speed independent of the number of patterns stored. They immediately map input patterns to the nearest stored patterns. However, if they store too many patterns, classification accuracy degrades.

These two properties of neurocomputing resemble our ability to recognise familiar faces, aromas, and melodies at

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On the contrary, computer search time always depends on the number of stored patterns or templates. Computers suffer from an inherent direct relationship between pattern number and search time: more patterns, longer search. This is why they fail at real-time pattern recognition. And it is arguably why artificial intelligence researchers, after more than 20 years, have failed to build real-time pattern recognisers and sensory processors on serial or parallel computers.

Bidirectional associative memories

A BAM stores and recalls associations (A_i, B_i) that are learned by summing correlation matrices. This procedure superimposes the patterns to be learned on the same memory medium, much as data pairs can be superimposed on a hologram (as in optical BAMs). Recall that the encoding procedure places the associations (A_i, B_i) at or near system energy minima. Each set of associations sculpts its own energy surface over the BAM state space. Associations are placed on the energy

surface like rocks on a rubber sheet. Geometrically, it is clear that the number of energy minima does not affect the speed with which an input pattern rolls down the surface into a particular local minimum. Hence, no matter how big the BAM (whether it consists of 10 neurons or 10 billion neurons), it immediately converges to the nearest minimum.

'Computers suffer from an inherent direct relationship between pattern number and search time: more patterns means a longer search.'

The BAM is a two-field network of symmetrically interconnected neurons, as shown in Fig 1. There are n neurons in $F_A = \{a_1, \dots, a_n\}$ and p neurons in $F_B = \{b_1, \dots, b_p\}$.

Each neuron is a simple nonlinear function. It transforms the sum of weighted input signals into a single output signal. In the simplest case, the output is binary, 1 or 0 (in general, a neuron's output signal continuously varies from 0 to 1). Stephen Grossberg of Boston University in the US has proven mathematically that to accurately store and process distributed information in a neural network, this signal function must be a sigmoid or S-shaped function, such as $(1 + e^{-x})^{-1}$.

and, indeed, the average firing frequency of real neurons is sigmoidal. The threshold function of a binary neuron is the limiting case of a steep continuous sigmoid function. This article assumes that the neurons in F_A and F_B are binary.

Each neuron turns on or off according to a threshold law. If the input to a neuron is positive, it turns on; if negative, off. When the input equals zero (threshold), the neuron maintains its current state; it stays on if it is on, and off if off. The larger the threshold, the fewer the neurons that can turn on. Increasing the threshold of all neurons in a field in effect increases the competition within the field for activation.

If all neurons in a field apply the threshold law to their inputs simultaneously, the BAM is operating synchronously. Otherwise, it operates asynchronously, simulating a collection of independent, randomly operating neurons. For simplicity, you can assume synchronous operation. For instance, if six neurons in F_A receive the vector of inputs $(6 \ -4 \ -1 \ 8 \ -3 \ 10)$, then the new F_A state is $(1 \ 0 \ 0 \ 1 \ 0 \ 1)$ — only neurons a_1 , a_4 , and a_6 turn on.

BAM encoding

Encoding is learning. A neural network learns by modifying the synapses between its neurons. In a BAM, all synaptic information is contained in an n -by- p connection matrix M . Every matrix M between F_A and F_B produces a stable BAM. All inputs quickly map to a pattern of stable reverberation. But different connection matrices encode different (A, B) associations as stable reverberations.

A BAM encodes a particular set of associations $\{(A_1, B_1), \dots, (A_m, B_m)\}$ by summing bipolar correlation matrices. This is an example of Hebbian, or correlation, learning. You can also interpret this method of encoding as Grossberg reciprocal outstar coding, in that each neuron in F_A and F_B fans out its output along modifiable pathways. The encoding scheme tends to place distinct associations (A_i, B_i) at or near local energy minima — provided you don't encode too many associations. You cannot reliably encode (store) and decode (recall) more patterns than the number n of neurons in field F_A or the number p of neurons in F_B , whichever is less; that is, given that you have m patterns, $m < \min(n, p)$. One way or another, the number of neurons in every neural network, artificial or biological, limits its stored capacity.

Bipolar vectors or matrices are binary

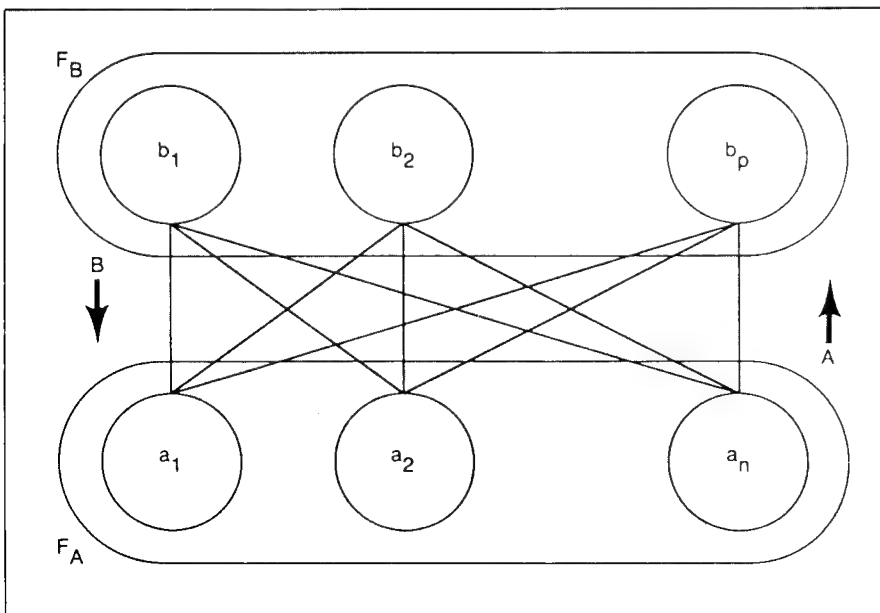


Fig 1 Topology of a BAM, showing the two fields of neurons connected by synapses

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When reliability is a decisive factor

vectors or matrices with -1s replacing 0s. The bipolar versions of the binary patterns $A_1 = (1 \ 0 \ 1 \ 0 \ 1 \ 0)$ and $B_1 = (1 \ 1 \ 0 \ 0)$ are $X_1 = (1 \ -1 \ 1 \ -1 \ 1 \ -1)$ and $Y_1 = (1 \ 1 \ -1 \ -1)$. In general, X and Y will denote the respective bipolar version of the binary vectors A and B . It can be shown that BAM correlation encoding improves if bipolar vectors and matrices are used instead of binary vectors and matrices.

The BAM encoding scheme converts each binary pair (A_i, B_i) to a bipolar pair (X_i, Y_i), converts each bipolar pair to a bipolar correlation matrix $X_i^T Y_i$, and then adds up the bipolar correlation matrices $M = X_1^T Y_1 + X_2^T Y_2 + \dots + X_m^T Y_m$ where the column vector X_i^T is the vector transpose of the row vector X_i . For example, if $X = (1 \ -1)$, then

$$X^T = \begin{pmatrix} 1 \\ -1 \end{pmatrix}.$$

A special case of the BAM occurs when $F_A = F_B$ and all $A_i = B_i$. Then $M = M^T$ and the BAM collapses to symmetric unidirectional associative memory that stores the single patterns A_i in local energy minima. (The general continuous version of the symmetric unidirectional associative memory is known as the Cohen-Grossberg autoassociator; the special binary version is known as the Hopfield model.) Let's assume the general case where F_A and F_B are distinct.

Suppose you want to find the BAM that encodes the two binary associations

$$A_1 = (1 \ 0 \ 1 \ 0 \ 1 \ 0) \quad B_1 = (1 \ 1 \ 0 \ 0), \\ A_2 = (1 \ 1 \ 1 \ 0 \ 0 \ 0) \quad B_2 = (1 \ 0 \ 1 \ 0).$$

Note that this example does not strain the memory capacity, since $2 < \min(6, 4)$. Convert these binary pairs to bipolar pairs:

$$X_1 = (1 \ -1 \ 1 \ -1 \ 1 \ -1) \\ Y_1 = (1 \ 1 \ -1 \ -1) \\ X_2 = (1 \ 1 \ 1 \ -1 \ -1 \ -1) \\ Y_2 = (1 \ -1 \ 1 \ -1).$$

Convert these two bipolar vector pairs to two bipolar correlation matrices:

$$X_1^T Y_1 = \begin{pmatrix} 1 & 1 & -1 & -1 \\ -1 & -1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ -1 & -1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ -1 & -1 & 1 & 1 \end{pmatrix} \\ X_2^T Y_2 = \begin{pmatrix} 1 & -1 & 1 & -1 \\ 1 & -1 & 1 & -1 \\ 1 & -1 & 1 & -1 \\ -1 & 1 & -1 & 1 \\ -1 & 1 & -1 & 1 \\ -1 & 1 & -1 & 1 \end{pmatrix}$$

Note that the j th row of the i th correlation matrix $X_i^T Y_i$ is simply Y_i multiplied by the j th element of X_i , and that the j th column is simply X_i multiplied by the j th element of Y_i . So correlation matrices can be written down directly when given bipolar associations. Then M is given by $M = X_1^T Y_1 + X_2^T Y_2$:

$$M = \begin{pmatrix} 2 & 0 & 0 & -2 \\ 0 & -2 & 2 & 0 \\ 2 & 0 & 0 & -2 \\ -2 & 0 & 0 & 2 \\ 0 & 2 & -2 & 0 \\ -2 & 0 & 0 & 2 \end{pmatrix}$$

This synaptic matrix encodes my particular computational problem; namely, storing (A_1, B_1) and (A_2, B_2) in a parallel distributed network. The matrix element m_{ij} indicates the symmetric (distance-dependent) synapse between neurons a_i and b_j . The synapse is excitatory if $m_{ij} > 0$, inhibitory if $m_{ij} < 0$. (Try drawing the BAM network topology obtained with this matrix M .)

You can erase association (A_i, B_i) from M by adding $-X_i^T Y_i$ to M . This is equivalent to encoding (A_i^c, B_i^c) or (A_i^c, B_i), where the superscript c denotes complement. The complement of $(0 \ 1 \ 1 \ 0 \ 0)$, for instance, is $(1 \ 0 \ 0 \ 1 \ 1)$. This is true because you obtain the complement of a bipolar vector by multiplying the vector by -1. A little thought then shows that when you encode (A_i, B_i) in M , you encode (A_i^c, B_i^c) in M as well, and vice versa.

The BAM energy E of association or state (A_i, B_i) is $-A_i^T M B_i^T$. In the example, $E(A_1, B_1) = E(A_2, B_2) = -6$. (In upcoming examples, you'll see that the BAM encoding algorithm placed (A_1, B_1) and (A_2, B_2) in local energy minima.)

BAM decoding

BAM decoding is associative recall. Say an input pattern A is presented to BAM field F_A . The n neurons across F_A are turned on or off according to whether the corresponding binary values of A are 1 or 0. Each neuron a_i in F_A fans out its binary value across the p pathways as if pouring water into a pipeline system. The synaptic value m_{ij} multiplies, or 'gates', the binary value a_i . Each neuron b_j in F_B receives a fan-in of input products $a_i m_{ij}$ from each of its n synaptic connections; b_j then behaves as an OR gate, since any neuron in F_A can activate it. Neuron b_j sums its input across all connections, $a_1 m_{1j} + a_2 m_{2j} + \dots + a_n m_{nj}$, then thresholds this sum to

- Step 1. For all i, j clear $M(i, j)$, $A(i)$, $B(i)$. This is an initialization step.
- Step 2. Get input into $A()$ and $B()$ for an association to be learned.
The input will have only two possible values, 0 or 1.
- Step 3. Learn the desired input association.
 - a. Build $X(i)$ for $A(i)$ where $X(i) = -1$ if $A(i) = 0$
and $X(i) = 1$ if $A(i) = 1$;
 - b. Build $Y(i)$ from $B(i)$ where $Y(i) = -1$ if $B(i) = 0$
and $Y(i) = 1$ if $B(i) = 1$;
 - c. For all i, j , build $M(i, j) = M(i, j) + X(i) * Y(j)$.
- Step 4. If there is another association to learn, go to step 2.
- Step 5. Input a new $A()$ and $B()$ to be run on the network.
The input for each element will have the values 0 or 1.
- Step 6. Run the A to B iteration of the network.
 - a. The new $B(j) = 1$ if the sum of $A(i) * M(i, j)$ for all i
is greater than the 0 threshold;
 - b. The new $B(j) = 0$ if the sum of $A(i) * M(i, j)$ for all i
is less than the 0 threshold;
 - c. The new $B(j)$ is unchanged if the sum of $A(i) * M(i, j)$
for all i is equal to the 0 threshold.
- Step 7. Run the B to A iteration of the network.
 - a. The new $A(i) = 1$ if the sum of $B(j) * M(i, j)$ for all j
is greater than the 0 threshold;
 - b. The new $A(i) = 0$ if the sum of $B(j) * M(i, j)$ for all j
is less than the 0 threshold;
 - c. The new $A(i)$ is unchanged if the sum of $B(j) * M(i, j)$
for all j is equal to the 0 threshold.
- Step 8. Repeat steps 6 and 7 until there are no changes in $A()$ and $B()$.
- Step 9. Display the results.

Listing 1 Pseudocode for a BAM demonstration program written in Basic

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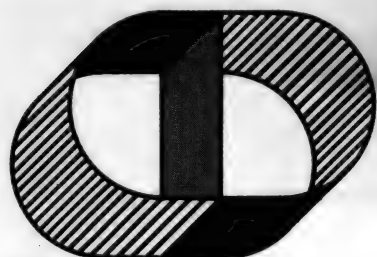
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generate its output binary signal. If the input sum exceeds b_i 's threshold, which I assume is 0, then b_i 's output is 1. If it is less than threshold, b_i 's output is 0. If it equals threshold, b_i maintains its current state. Neuron b_i then fans out its output signal across the n pathways m_{ij} to each neuron a_i in F_A . This means F_B uses the transpose memory M^T to send information, while F_A uses M .

Each a_i then generates its binary signal from all its summed inputs and sends it back to F_B . And round and round the BAM goes. Fortunately, it is a mathematical theorem that the BAM always rapidly converges, so it will not oscillate chaotically forever. (Exercise: Show that a state change in F_A or F_B and the threshold signal law forces the

energy E to decrease, and that E cannot decrease forever. This is sufficient to prove that any matrix M produces a stable BAM.)

BAM decoding is easier done than said. Returning to the example, let's see if the memory matrix M actually stores the pairs (A_1, B_1) and (A_2, B_2) . You do this by presenting A_1 to the BAM and observing whether (A_1, B_1) is recalled. If it is, then either A_1 or B_1 will recall (A_1, B_1) . Repeat this test for A_2 and B_2 .

Vector-matrix multiplication summarises BAM forward and backward information flow. Forward flow proceeds through M , and backward through M^T . The row vector $A M = (4 \ 2 \ -2 \ -4)$ is the vector of fan-in inputs received by F_B . The threshold-signal law then yields $(4$

$2 \ -2 \ -4) \rightarrow (1 \ 1 \ 0 \ 0) = B_1$, since you are synchronously updating all neurons in F_B . So A_1 evoked B_1 . B_1 then sends an M^T -filtered vector of signals back to F_A : $B M^T = (2 \ -2 \ 2 \ -2 \ 2 \ -2) \rightarrow (1 \ 0 \ 1 \ 0 \ 1 \ 0) = A_1$. If you now push A_1 through M again, B_1 results, which again evokes A_1 , and so on forever. Thus, the short-term memory pattern (A_1, B_1) reverberates across the BAM. It is a stable equilibrium point of the dynamic system. Put another way, both A_1 and B_1 recall the stored association (A_1, B_1) . Similarly, $A_2 M = (4 \ -2 \ 2 \ -4) \rightarrow (1 \ 0 \ 1 \ 0) = B_2$, and $B_2 M^T = (2 \ 2 \ 2 \ -2 \ -2 \ -2) \rightarrow (1 \ 1 \ 1 \ 0 \ 0 \ 0) = A_2$. So (A_2, B_2) is also stored as a stable point. An instructive exercise would be to see how many synapses in M you can remove or change without affecting these stable

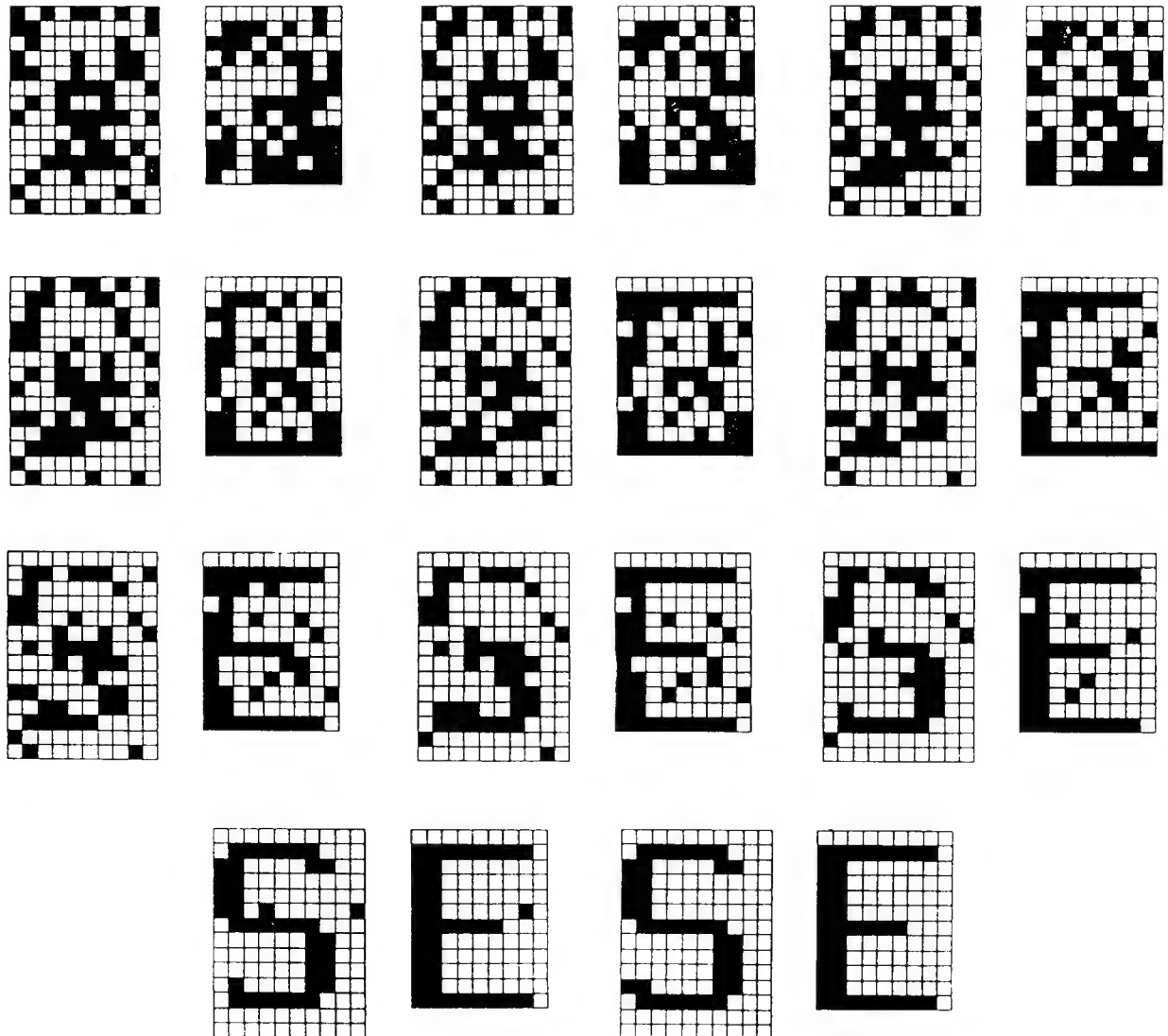


Fig 2 Asynchronous recall in a BAM consisting of two fields of neurons, one containing 140 neurons and another containing 108 neurons



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reverberations.

The BAM is error-correcting. Partial or noisy patterns tend to recall complete patterns. For example, the input $A = (0\ 1\ 1\ 0\ 0\ 0)$ is just A_2 perturbed by 1 bit. Then $A M = (2\ -2\ 2\ -2) \rightarrow (1\ 0\ 1\ 0) = B_2$, and thus A evokes the resonant pair (A_2, B_2) . Note that (A, B_2) has energy $E(A, B_2) = -4 > -6 = E(A_2, B_2)$, evidence that the BAM encoding procedure placed (A_2, B_2) at a local energy minimum.

Suppose you add the new association (A_3, B_3) to the BAM memory M , where $A_3 = (1\ 1\ 0\ 0\ 1\ 1)$ $B_3 = (0\ 1\ 1\ 1)$. This strains the BAM's storage capacity but does not exceed it. Geometrically, when you store only a few association patterns (A, B) , each forms a large basin of attraction in the BAM state space. As you add more patterns to the BAM, the basins increase in number but shrink in diameter and depth. The BAM recognises fewer input patterns by stored associations. Worse, spurious attractor basins can emerge, causing misclassification. When this happens, the BAM experiences a type of déjà vu, since it remembers something it never learned.

In this case, the new memory $M = X_1^T Y_1 + X_2^T Y_2 + X_3^T Y_3$ is given by

$$M = \begin{pmatrix} 1 & 1 & 1 & -1 \\ -1 & -1 & 3 & 1 \\ 3 & -1 & -1 & -3 \\ -1 & -1 & -1 & 1 \\ -1 & 3 & -1 & 1 \\ -3 & 1 & 1 & 3 \end{pmatrix}$$

When you retest to see if (A_1, B_1) and (A_2, B_2) are still stable points, you'll find that they are, since $E(A_1, B_1) = E(A_2, B_2) = -6$. To test A_3 , $A_3 M = (-4\ 4\ 4\ 4) \rightarrow (0\ 1\ 1\ 1) = B_3$, and $B_3 M^T = (1\ 3\ -5\ -1\ 3\ 5) \rightarrow (1\ 1\ 0\ 0\ 1\ 1) = A_3$. So (A_3, B_3) is also a resonant stable point, but with energy that's twice as small, namely, $E(A_3, B_3) = -12$. Since (A_3, B_3) is a deeper basin, you can expect it to attract and classify more patterns. The unit input $(1\ 1\ 1\ 1\ 1\ 1)$, which is 1 bit closer to A_3 than to A_1 or A_2 , recalls (A_3, B_3) . But if you flip the last bit, the new input $(1\ 1\ 1\ 1\ 1\ 0)$ misclassifies to a spurious association (A, B) , where $A = (1\ 1\ 1\ 0\ 1\ 0)$ and $B = (1\ 1\ 1\ 0)$, also with energy $E(A, B) = -6$. Such misclassification reflects that you have almost overstuffed the BAM memory matrix M .

If you'd like to experiment with the above algorithm, Duane DeSieno, Rod Taber, and Joel Davis have provided programs in Basic, Pascal, and C. [Editor's note: these programs are available for downloading from Microtex on Telecom's Viatel, page *6663#.] Listing 1 shows pseudocode for the Basic program.

Asynchronous BAM recall

Fig 2 illustrates asynchronous BAM recall. Field F_A contains $n = 10 \times 14 = 140$ neurons. F_B contains $p = 9 \times 12 = 108$ neurons. Both vector fields are arranged as binary matrices to help the eye detect interesting spatial patterns. The BAM stores the three alphabetic associations: (M, V) , (S, E) , and (G, N) . A 40 per cent noise-corrupted version (99 bits randomly flipped) of (S, E) is presented to the BAM. Fig 2 shows 11 snapshots of the asynchronous recall process. At each clock cycle, roughly six randomly chosen neurons are allowed to make update (state-change) decisions. This is a cross-section

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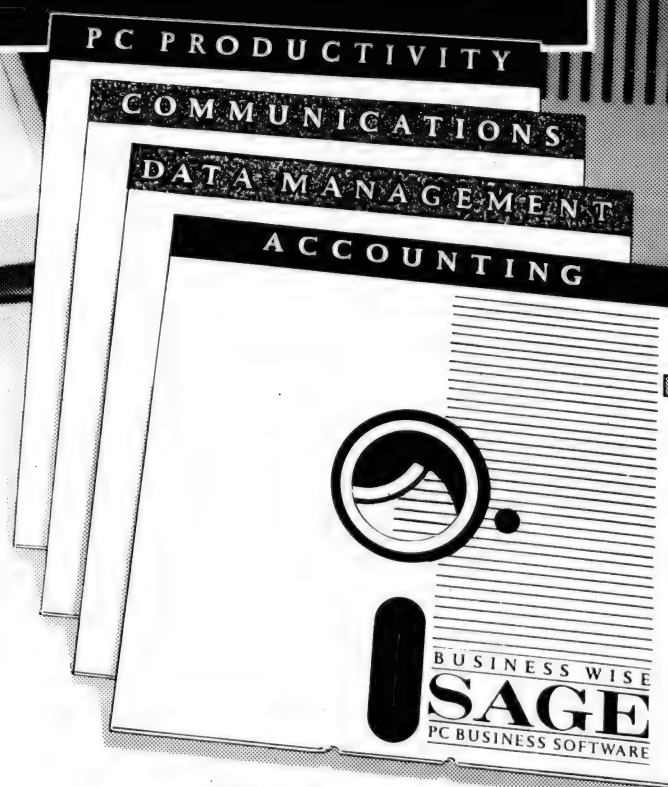
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tional approximation of a stochastic neural process — a set of independent neurons, each randomly updating in time.

Different random-update choices produce different asynchronous-recall trajectories. In this BAM, most trajectories recall the desired nearest stored association, since the memory capacity is not strained and the spatial patterns all differ significantly. In Fig 2, (S, E) is perfectly recalled, as the neurons independently proceed from local chaos to global order — without any neuron aware of its global effects. The anarchical neurons are guided as if by an invisible hand to correct global system errors without knowing that such errors

have occurred and need to be corrected.

Finally, BAMs are perhaps best implemented in optics, with photons instead of electrons. Neurons in fields F_A and F_B can be totally interconnected to each other with simple lenses. Using resistors to interconnect amplifiers is much more difficult, space consuming, and expensive. Unlike electrical pathways, optical-interconnect beams can pass through one another without interference.

END

For more information

Associative-memory literature is mathematical, interdisciplinary, and vast. McCulloch and Pitts introduced the first Boolean switching-function neurons in 1943. Kohonen largely pioneered the study of correlation-matrix memories. His 1984 book is a standard in the field. Steinbuch put forth the idea of stable points in crossbar associative networks in his 1961 'learning matrix.'

Amari et al first made the rigorous connection between associative networks and thermodynamics. Hopfield next made the connection between stable points and energy minima by establishing an isomorphism between symmetric binary networks and the Ising spin-glass model of ferromagnetism in statistical mechanics. Grossberg et al have proven all of the above and more with rigorous mathematics. With Carpenter, Grossberg developed the adaptive resonance model that, in some sense, an adaptive BAM approximates.

Grossberg's 1982 and 1987 volumes are the Old and New Testaments of neural networks — read them. I developed the BAM and have extended it to real-time unsupervised learning. The 1986 volumes of Rumelhart and McClelland provide an accessible introduction to neural networks from a cognitive-science perspective.

For further reading

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Online databases

All it takes is a micro and a modem and anyone can be information rich. The range of information just waiting to be tapped is staggeringly diverse. Robin Howells has been reviewing major Australian hosts to report on database developments.

The big 'buzz words' of the 1980s are 'information' and 'information-rich' and Australia is a mine of information for business, professional and hobby people who want to seek it using a computer and a modem. Figures compiled by the Australian Database Development Association show that from 1984 to 1986 the number of online databases increased from 108 to 217. Norbert Wiener, a US pioneer in computing who died in 1964 before the beginning of the PC revolution, recognised the importance of information in 1954. He said: "To live effectively is to live with adequate information."

Eight major hosts dominate the local industry and offer an array of databases which cover

a spectrum of major, minor and esoteric interests. They are, in alphabetic order, ACI Ausinet, CLIRS, CSA InfoNet, CSIRO Australis, Elders FarmLink, Information Express, I.P. Sharp and Viatel.

ACI Ausinet

The core of the Ausinet offerings is the 'Executive Information Service' which is a collection of databases emphasising business, finance, economics and domestic and international affairs.

Five areas make up the service:

- Ausinet
- Statex
- World Reporter
- World Exporter
- Magic



Australian Consolidated Press publishes the Australian Political Register on Ausinet

Ausinet is a good place to start if you are looking for Australian information, because it is built up from over 30 databases. Some of these databases are bibliographic, giving you the references to the source of the information while others present you with the full text of the article you are looking for. Full text examples include The Bulletin, Australian Business, The Australian Financial Review, Business Review Weekly, The Australian Political Register and other valuable business sources.

Statex provides instant access to financial and shareprice information on over 1300 public companies listed on all Australian Stock Exchanges. It originates from the Sydney Stock Exchange and because the information is numeric

you can put in values to generate financial reports. For investors, portfolio managers and takeover tycoons it is a quick way of having, within three or four minutes, financial up-to-date comparisons of four or five companies.

With Australian businesses being implored to seek out more export business, demand for the World Reporter database is likely to rise. It is a source of international information spanning international and national events, business, economics, government, commerce, current affairs and politics. There are 36 different sources currently in the World Reporter database gathered from around the globe. They include the Dow Jones News Ser-

vice, The Financial Times, Wall Street Journal extracts, Tenders Electronic Daily, BBC Summary of World Broadcasts, TASS newswire, Keesing's Record of World Events, Asahi News and the World Bank International Business Opportunities Service.

World Exporter is a rich source of intelligence on international investment opportunities and risks. Users of World Exporter will have advance notice of real market opportunities, worldwide in-depth assessment and analysis of economic, political and security risks, trade finance and currency briefings. The information is sourced from the Euromoney Trade Finance and Currency Reports, International Risk Data, Sales Leads International, and others.

Magic is a service targeted at marketing organisations, advertising agencies, public relations firms and the advertising, PR and marketing departments of large and medium firms. It is based on original research carried out by Mintel and the Henley Centre for Forecasting. It offers rapid access to reports on products, industries, markets, buying patterns, consumer spending, advertising and marketing trends.

Six business directories on the Ausinet service should be of interest to astute business people. The Australian political register (APOL) is packed with current information on each State and Federal parliament, political parties, diplomatic representatives in Australia and our own abroad. Details of over 8000 Australian public and private companies, updated quarterly, is on Business Who's Who of Australia (BWVA). Tenders for public contracts in Japan and the EEC are in Tenders Electronic Daily (TED). In World Bank International Business Opportunities (IBOS) are details of all projects seeking World Bank funding. Details of forthcoming large scale development projects around the world are in Plans and Projects Monitor (PPM). In the Metra National Development Plans (NDP) are summaries of the development plans of over 70 countries.

Index and other business databases on Ausinet include the Australian Business Index (ABIX), which is an index to business items from publications including The Sydney Morning Herald, The Age, The Australian, The Australian Financial Review, Australian Business, Rydges, BRW, The Bulletin, Personal Investment and others. Business Brief and Hansard Service (BBHS) is an index to parliamentary bills, questions, proposed legislation, policy statements and ministerial press releases. Australian Public Affairs Information Service (APAI) provides an index to Australian social, cultural, political and economic affairs from periodical articles, newspaper material, books and conference papers.

In research and bibliographic databases you can choose from the Australian Art Index, Australian Databases, Australian Education Index, Australian Architectural Database, ARTS Documentation Service, Australian Transport Literature, Cumulative Abstracts of Defence Readings, National Criminological Holdings, Directory of Educational Research, Australian Energy Research and Development, Road Safety Retrieval System, Great Barrier Reef Marine Park or Australian Software Locator.

Online review

Searching online for information through Ausinet produces a wealth of facts during every search. Using the powerful search techniques it was an easy job to locate all the articles which appeared in a national financial daily from December 1, 1986 to the day of the search which pertained to 'Media Ownership.' There were 25 documents found. However an earlier search, in which I told the program to find every occurrence of 'media' adjacent to 'ownership' discovered 4346 documents which mentioned 'media', 2345 with 'ownership' and 167 with the two adjacent. All that was reported in seconds. Try doing that with 4346 documents or see how long your staff take to do it.

A precis of each document's contents, with the issue date, page number and the approximate number of lines can then be called up. The headlines came pouring across the screen: 'Media barons slam decision to oppose current ownership bill', 'Media rule may mean only five TV owners: Macphee'. Next I decided to search APOL, the Australian Political Register which is maintained by the electronic publishing division of Australian Consolidated Press. APOL was able to tell me a mind-boggling array of information about all Federal and State parliamentarians. Electorate and Ministerial office addresses, phone, telex and fax numbers, names of staff and their positions. Everything the determined lobbyist would want. APOL is

usually updated twice weekly and major political events such as an election or ministry reshuffle should be made within four days.

A short search through the CCH: Australian Tax Index under the subject headings of 'Journalist', 'Writer' and 'Author' made me so depressed that I decided another search area was needed. My attention went to APAI, the Australian Public Affairs Information Service maintained by the National Library of Australia. With coverage going back to 1978 I was able to rapidly search 111,909 documents for 'media adjacent to ownership.' The quick-fire results were 'media' only found in 1565 documents, 'ownership' in 227 and 'media ownership' in 38.

The time spent on Ausinet convinced me that online database searching can save time and money when you consider the results achieved in a short time. All the information I located, a lot of it unreported here due to space constraints, would have taken hours of work searching through newspaper files etc. Yet it was all located at a terminal in under one hour.

CLIRS

CLIRS is an acronym for Computerised Legal Information Retrieval Service and it provides the full text of Commonwealth and State legislation, Case Law and a vast range of other useful information for the legal fraternity. CLIRS has the electronic publishing rights for the Commonwealth and all States legal information. In about two months the full text of all rulings by the Taxation Office will come online.

Case Law is the most popular information accessed, with information on New South Wales cases being most studied followed by High Court decisions. The second most popular database is Legislation. Commonwealth and State Legislation online at CLIRS is more up-to-date than the latest printing.

CLIRS is a series of around 50 databases for the legal profession which aims to give instant access to the law. In addition to the Case Law and Legislation databases, it has databases dedicated to land and property information, legal reference materials, legal practice papers, company financial and taxation services, corporate information, political monitoring and directories, Australian Resources Industry and newsletters and library services.

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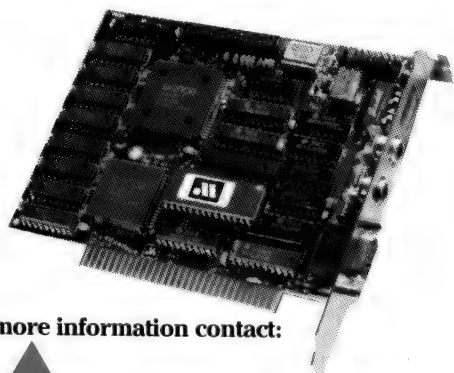
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RYAN v HARRISON (1957) VR 210

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libel action arising out of a letter published during a hotly contested
parliamentary election in which the plaintiff was one of the candidates. In

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he exposed the cause from the place where it ought naturally to be tried, and
by that I understood him to mean at Ballarat where the libel was published.
He, however, said, at p. 442: "I do not think it is reasonably probable that

.....

2.
ROBINSON PRODUCTS LTD v JAMES ROBINSON PTY LTD (No 1) (1952) VR 421

.....
plaintiff in consequence of the defendant's representations. "There was no
libel, not enough, nor libel, not being trade libel, nor is a shadowy possibility
of actions being brought enough." The defendant here has been selling his

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3.
MAVISH v ASSOCIATED NEWSPAPERS LTD (1959) VR 57

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the security architecture for the Reference Model of Open Systems

Interconnection;

To monitor and participate in the work of CCITT SG-11/11 concerning

security measures for telematic services; and

To monitor and participate in the work of ISO/TC68/SC2 concerning

security procedures for communicating banking applications.

These activities will involve a study of basic cryptographic

techniques including algorithms, key management strategies and

systems, and communication protocol requirements.

Communications security, standards; Cryptography, communications4

CLIRS: a libel search on Victorian reports

A search for CRYPTOGRAPHS\$ on CSIRO's Australis

and European law libraries and Pergamon Infoline is one of Europe's leading online information services. Pergamon Infoline is an international database with coverage of world resources. These include International Petroleum Abstracts, Geomechanics Abstracts and Waterlit. ABN is the Australian Bibliographic Network which is a co-operative cataloging project co-ordinated by the Australian National Library. Earlier this year over 500,000 catalogue cards were held. ABN records cover books, serials, projected media, music, cartographic materials, sound recordings, pictorial materials, realia, government reports, newspapers, standards, conference papers and theses. The database is dominated by material from 1970 onwards with earlier records being added.

Cityscope — the commercial property guide is also available online. It contains land and property details of the Sydney and Melbourne CBDs, including full property descriptions with official land value, assessed annual value, ownership, boundaries, tenancies, sale prices, development applications and historical notes.

Lawyers, accountants and other professional advisers will also be interested in Business News Law on CLIRS. It covers new legislation, changes in the direction of government policies, changes in government practices, court decisions which result in major shifts in emphasis in legal interpretation and changes in legal, accounting and business practices.

Online review

Everyone is affected by the law at some time during their lives and the

public's continuing fascination with the law is shown by the number of TV programs like 'Rumpole of the Old Bailey', 'LA Law' and 'Learned Friends' which regularly appear on our screens.

That's why I welcomed the opportunity to peek under the black gown and wig to see the way in which the legal fraternity can use CLIRS, the computerised information retrieval service. After log-on the opening menu allows you to select from:

- CLIRS Text Databases
- Land Titles Final Search
- Commonwealth & ACT Materials
- LEXIS Connection Information
- COMPUCAST
- PERGAMON INFOLINE
- CLIRS Direct Access
- Business Law News
- Australian Resources Industry Database

Database file

Host: CLIRS Ltd

Cost: Subscribers contract to use

two, four or eight hours

monthly online. The Level

Two, providing two hours

monthly, is \$3360 per year

Speed: V21, V22, V23. V22bis will

be available when Austpac

starts offering it later this year

Protocol: 7 E 1

Language: Status

Security: A Username and a

Password is allocated

Enquiries: CLIRS Ltd, Level 39,

MLC Centre, Martin Place,

Sydney NSW 2000 or phone

(02) 233 1955. Branch offices

in all States

At this point I decided to search the decisions of the Administrative Appeals Tribunal, using the command 'AAT-DEC'. With the search instruction 'q freedom/2/information+telecom' I discovered six articles in which Freedom of Information and Telecom were mentioned.

My companion was surprised to see that the details of the first AAT decision to come up on the screen related to 'Re: ROBIN F. HOWELLS And: AUSTRALIAN TELECOMMUNICATIONS COMMISSION.' The report summarised my appeal to the AAT some months ago when I argued that my Freedom of Information request to Telecom was in the public interest and that Telecom should not charge me for the documents I was seeking as a journalist. The matters were summarised in the AAT report using the following catchwords: 'freedom of information — imposition of charges — discretion to impose — whether public interest test applies — freedom of information — remission of charges — whether decision reviewable.' The report certainly included all the essential information of the appeal, including the fact that I lost.

The next search was in the Federal Political and Government Directory. This database is provided by The Political Reference Service Pty Ltd. It is packed with political information and is a goldmine for people wanting to find out anything about any politician in the land.

To ensure that CLIRS users know what is happening in the information retrieval industry, they offer INFOPAC as one of their databases. INFOPAC is run by Harker's Information Retrieval. A quick browse showed that it is a

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5" 16bit 128k card (AT)	\$135
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5" Hard Disk Controller (XT)	\$135
FDD/HDD controller (AT)	\$475

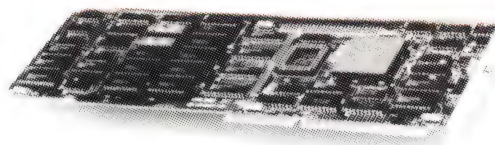
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Fuji 3.5" 32Mbyte	\$ call

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specialist newsletter that provides a comprehensive coverage of online information developments in Australasia, South East Asia and the South Pacific Regions. INFOPAC looks at all the local changes and 'happenings' within the industry and also records any major international developments.

TAX DIGEST is intended to keep users abreast of current taxation developments and is provided by leading accountant Coopers & Lybrand. A quick search in this database for 'partnership' located 92 articles faster than the Tax Office can issue a refund cheque. A subsequent search coupling 'agreement' with the earlier request, quickly located 21 articles on the subject of 'partnership agreement'. Using the command 'q journalist,author,writer' found nine articles with interesting taxation advice pertinent to a struggling scribbler.

The area of unreported judgments is one where CLIRS is proving to be invaluable to the legal profession. In Victoria, as in most other States, there is often a delay of 18 months before judgments are available in printed form. With the Commonwealth Law Reports the delay is about three years. It is so much easier for the CLIRS user to locate important cases which are not yet in printed form.

CSA Infobank

Infobank Australia is a total data resource available throughout Australia on Computer Sciences of Australia's international network, Infonet. Until recently it maintained many large databases on CSA's Univac mainframe which were accessible online over the telephone by Infobank customers. Included were the full 1971, 1976, 1981 ABS Censuses of Population & Housing, ABS Economic time-series going back to the 1950's, NIF-10 the Treasury developed model of the Australian economy, AMIS — The Australian Municipal Information System which included six databases on Local Government social and economic statistics, ABS Annual Agricultural Census, ABS Grouped Enterprise statistics giving financial data by industry sector and various motor vehicle registration databases.

Currently only the 1981 ABS Census of Population & Housing is available to online Infobank customers. Those wanting online access to any of these databases or to any public dataset should discuss their individual requirements with Chris Howell on (02) 489 6632 or Maria Thomas (02) 439 0033

in Sydney or a CSA representative in any of the other capital cities. This reduction in directly accessible online databases reflects a change in emphasis by CSA to increased personal service.

"The volume of public datasets has increased dramatically in recent years," Chris Howell CSA consultant says. "We recognise the increasing complexity of available data and the increasing sophistication of requested information. We also believe that there are many people who require data less regularly, in smaller more usable quantities and need it in the most convenient form with the easiest possible access. And of course at reasonable cost."

"So we offer customised tables of requested data on IBM compatible floppy disks ready for use by our customers on their own personal computers using their choice of software. The unimaginably large mass of data stays on CSA's mainframe. We will write the programs to extract what's needed and download the resultant small manageable files over dedicated high speed lines to IBM PCs. If necessary we then convert these files into formats most convenient for the customer. All this is done to an agreed budget."

An interesting part of CSA business is the statistical comparison of the client's own data (customer numbers byproduct type by postcode) with population and housing data to define customer profiles and identify new target markets.

Also of interest are the CSA motor vehicle databases. These give full details of every registered vehicle in NSW, Victoria, South Australia and Queensland. About 10 million records

or an estimated 85 per cent of all vehicles in Australia. So if you want to know how many five year old Ford utilities there are, where they are — even what colour they are — CSA can help.

CSIRO Australis

If an online service had an aroma you could almost smell the billy tea and gum leaves on Australis. That's probably because this impressive CSIRO information retrieval service is jam-packed with uniquely Australian information. There are 27 individual databases on Australis in three categories: general databases, research in progress databases and CSIRO databases.

"The main emphasis of Australis is in the area of Australian science and technology," manager Sue Harvey says. "However, this year we have added a number of databases from other disciplines. For example: HERA — Heritage Australia, IREL — Industrial Relations and FAMI — FAMILY from the Australian Institute of Family Studies."

"The Leisure database, providing information on Australian recreation and sport will be available shortly. One of the databases which is creating a great deal of interest is the Conferences file."

She points out that the unique features of the Australis databases are the Research in Progress information. Unlike most databases, which provide essentially historical information, these provide information about current research activities in Australia in the areas of agriculture, marine sciences, computing and telecommunications, energy, and CSIRO's research programs. This could be very valuable information for planners, business people, academics etc.

Australis is in the forefront reporting news vital to computer buffs. Its database CRIP is devoted to Australian Computer Research in Progress. CRIP contains details of Australian computer research projects as collected from organisations carrying out the research.

Included is research on computer architecture and software, components, circuits, peripheral equipment, image/graphic systems, communication control systems, and environmental and social issues are included.

The Australian Bibliography of Agriculture (ABOA) has the highest level of usage on Australis. ABOA is accessed by all the State Departments of Agriculture and lists documents related to agriculture and rural development,

Database file

Host: Computer Sciences of Australia — Infobank

Cost: Depends on the data requested and the time taken to extract it

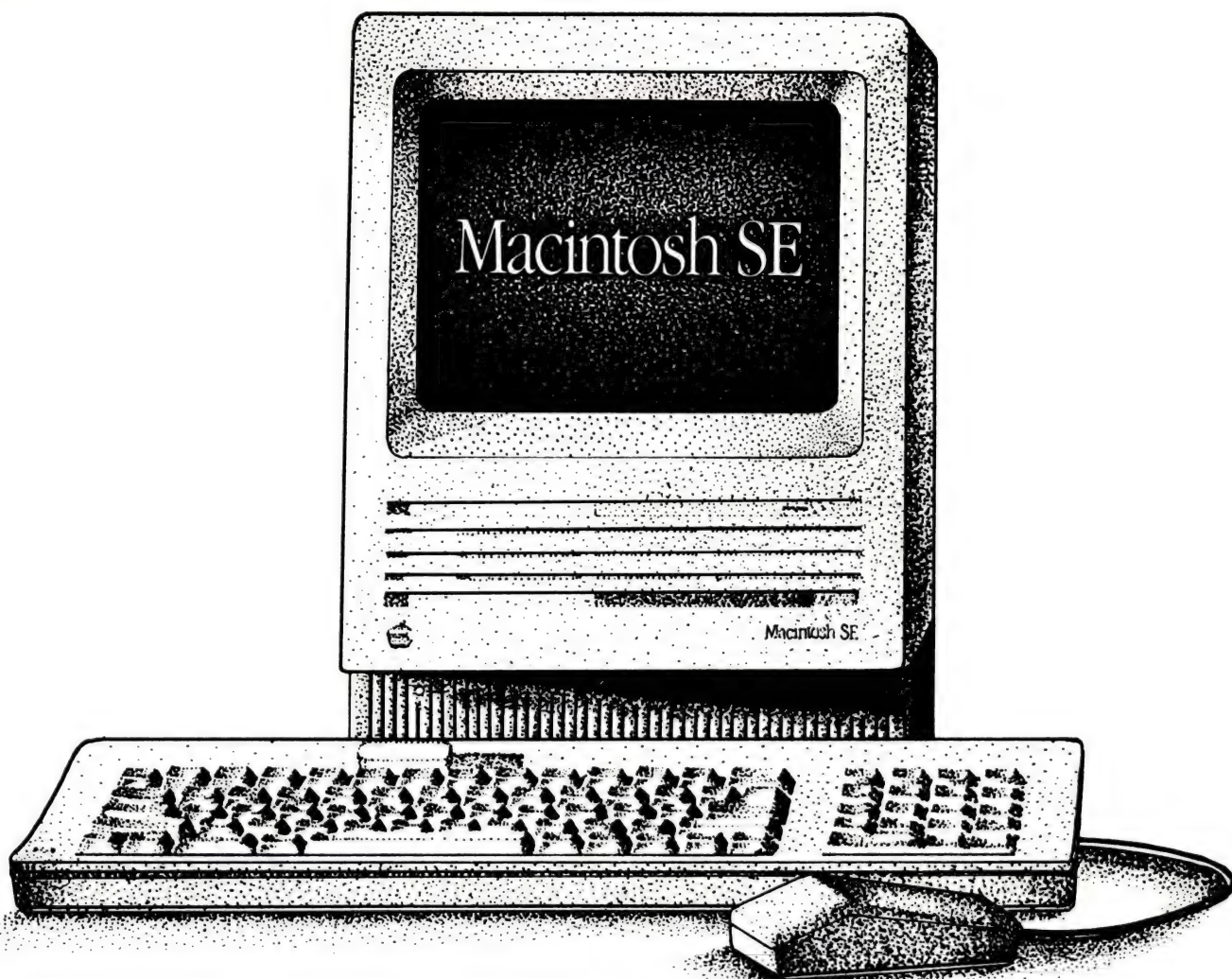
Speed: V21, V22

Protocol: 8 N 1

Language: Database query language

Security: A Username and a Password is allocated

Enquiries: Computer Sciences of Australia, 460 Pacific Highway, St Leonards NSW 2065 or phone (02) 439 0033. Branch offices in all States except Tasmania



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512K/800	\$2,895	\$4,395
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128K	\$3,495	\$4,980

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forestry, fisheries, food science and technology and human nutrition.

Wine industry people will find plenty to interest them in the WINE database with its comprehensive coverage of Australian and New Zealand wine industry information. WINE also includes European research papers listed in the West German database VITISVEA, as well as some South African and American material on wine and viticulture published since 1980.

Another unusual one on Australis is RED the Renewable Energy Directory. Energy conservation and management, solar, wind, water, ocean and geothermal energy, and renewable energy are among the topics covered. It also contains the names of experts on, and products related to, renewable energy and energy management available in 19 Pacific and Asian countries.

Online review

What is happening in the area of computer research in Australia? That was the question I wanted answered as soon as I logged on to Australis. I am one of those people who remember when Australia was a world leader in computing with the CSIRAC first generation computer designed in 1947 by Maston Beard and Trevor Pearcey of CSIRO. Australian Computer Research in Progress (CRIP) has the answers for research which is being disclosed.

Surprisingly, cryptography and its application in computing is one of the major research areas. There were five occurrences found searching 'CRYPTOGRAPHY'. Illegal hackers will probably not be surprised to know that my search showed that research into the security of computer communication systems and telematic services is being undertaken right now by the Telecom Australia, Customer Services and Systems Branch, Access Control and Authentication Section, at Clayton, Victoria.

Among the objects of the research is to monitor and participate in work concerning data cryptographic techniques and to monitor and participate in work concerning security measures for telematic services. Telecom is also working on monitoring and participating in work concerning security procedures for communicating banking applications.

The methods to be used in this research will involve a study of basic cryptographic techniques including algorithms, key management strategies and systems, and communication protocol requirements.

At the University of Tasmania, Department of Mathematics in Hobart, Professor R Lidl is carrying out another fascinating piece of research. The object is to develop new cryptosystems and improve existing cryptosystems for applications in secure communications. It is planned to evaluate security and improve performance of RSA type cryptosystems, to connect cryptosystems with algebraic codes and to test security of public-key cryptosystems based on pseudo-random sequences or on discrete logarithms!

Setting up a search under 'Security' produced 25 occurrences in eight documents. Email Limited, Computer Systems in Mooroolbark, Victoria states the object of its research as being: "To investigate the application of gate arrays in Australian electronic computer equipment as a means of reducing cost and improving product security."

After evaluation of its product range a certain section of a product will be chosen as being applicable for gate arraying. By using the newly established CEMA facilities a small number of prototypes will be produced. Detailed testing will be carried out. After detailed testing, a cost benefit analysis

will be carried out to determine the quantities required to make gate arrays economic in Australian products and the types of product to which gate arrays are most appropriate.

CRIP then told me that at the Monash University, Department of Computer Science in Clayton, Victoria Dr KJ McDonnell's research project has the objective of 'Investigation and prototype implementation of a distributed network directory system in accordance with the CCITT standardisation proposals.'

Next, it was on to the Conferences database which is creating a great deal of interest. It is a conference announcements file and is used in a variety of ways. Public relations personnel can use it to identify promotional opportunities. Conference organisers find it useful to ensure that their conference does not clash with another. People wishing to plan both work and holiday itineraries can refer to it. It is also a valuable aid to obtaining copies of conference papers, as the records of conferences held since 1984 remain in the file.

If you are looking for a conference to attend in Queensland in December 1987 I can now recommend the Fourth Australian Workshop on Oil Shale. Telephone Dr Peter Bell, Department of Chemical Engineering, University of Queensland, St Lucia, Queensland on (07) 377 2333 and tell him you found out about the workshop to be held from 3-4 December on Australis.

How about attending the First National Conference on Government Publishing in Australia, scheduled to be held from 29-30 October, 1987 at the Lakeside Reception Centre, Royal Melbourne Zoological Gardens? Workshop sessions likely to be of interest to *Australian Personal Computer* readers will be held on Desktop editing/publishing, creating databases for publicity and promotion, servicing the customers and online access to Government publications. Contact Mr Jeff Prentice, Convenor, CSIRO Bookshop, 314 Albert Street, East Melbourne, Victoria 3002 Telephone (03) 418 7392.

Back to nature types will find plenty to interest them in RED the Renewable Energy Directory. Searching for 'WIND' produced 128 occurrences in 62 documents giving details of experiments and applications harnessing wind power. Narrowing the search to 'VICTORIA' found nine occurrences in seven documents.

The database Australian Rural Research in Progress (RRIP), has 2464 records. Because I believe that the freshwater yabby is a gourmet

Database file

Host: CSIRO Australis

Cost: CSIRONET account

maintenance fee \$100 per year.

Dial-up access surcharge

\$3.50 per connect hour.

Database connect time rates,

which vary between \$30 and

\$85 an hour, are then added.

Offline printing network

charges — first page 60c,

subsequent pages 6c.

Database charges vary from

nil to 40c per page

Speed: V21, V22. V22bis will be available in the near future, in some States

Protocol: 7 N 1 Some comms

software may require 8 data

bits

Language: STAIRS

Security: A Project Identifier (PID)

and User Identifier (UID) are

needed. Password protection

is available at both the PID

and UID levels

Enquiries: CSIRO — Australis,

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delight, I decided to see whether its food potential is being researched. A rapid search of RRIP for 'yabbies or yabby' hooked four occurrences of 'yabbies' in three documents and one 'yabby' in one document. Battery culture of freshwater crayfish is being undertaken at the Western Australian Institute of Technology (School of Biology). Dr J Kowarsky is carrying out research to optimise survival, growth and food conversion efficiency of freshwater crayfish of the genus *Cherax* while minimising resource usage under conditions of intensive battery culture.

Over at the Warrnambool Institute of Advanced Education in western Victoria, Dr BD Mitchell is investigating a practical, cost-effective scheme for commercial culture of fresh water crayfish under intensive field-scale tank culture.

Among other documents found by this search were the proceedings of the first freshwater aquaculture workshop, organised by the New South Wales Department of Agriculture, Division of Fisheries held at Narrandera, NSW on February 21, 1983.

Searching for 'salmon and atlantic' landed a fascinating report on the establishment of Tasmanian Atlantic salmon brood stocks by the Tasmanian Department of Sea Fisheries. Its research aims to produce a brood of 10,000 Atlantic salmon fingerlings for sea-cage culture trials with private enterprise groups.

Did you also know that Salmon Enterprises of Tasmania is researching the development of a commercial Atlantic salmon sea cage farming industry? Feasibility studies commenced in 1983, followed by project planning, establishment of a quarantine hatchery to import eyed Atlantic salmon ova and development of a model seafarm.

Elderlink

In mid-1983 Elders Pastoral recognised the need to find a more appropriate means of communicating to its vast number of clients. After studying the English Prestel service they conducted trials late in 1983 to determine the viability and effectiveness of the service in Australia.

Elderlink, Australia's largest privately run videotex service was released to the rural community in 1984 under the name of Farmlink. This gave the Australian farmer access, for the first time, to an extensive range of marketing and management information backed by the resources of Elders Pastoral. Since the launch, Farmlink has con-

Database file

Host: Elderlink
Cost: Annual subscription \$149, if using your own equipment.
Communication charges for country areas via Austpac are \$6.50 per hour during business hours. Off-peak, from 6pm to 8am is \$4 per hour. In metropolitan areas the comparable rates are just \$4 and \$2 per hour. Computer connect charge during business hours is \$10 per hour with \$7 per hour off-peak. There is no page surcharge or mainframe storage fee
Speed: V23
Protocol: A videotex communications software program will be needed
Security: Security of access is closely controlled in Elderlink. The system is accessed via a six digit user number. A user's password of four characters can be a combination of letters or digits. As soon as a password is assigned to a new user it must be changed after initial access to Elderlink is gained. Elderlink has also instituted a further security system requiring passwords to be changed every 30 days as a further protection for the system and the user
Enquiries: Information is available at all Elders Pastoral branches, State offices or by ringing toll free (008) 888 390. If you want to write with a thumbnail dipped in tar, the address is Ms Anna Candler, Elderlink, 27 Currie Street, Adelaide SA 5000

tinued to expand to match the growing demands for more technical and business data.

In 1986 Sharelink was developed to complement the growing financial database. This section provides a feed from the Australian Stock Exchange, including the second boards, and covers the daily trading data of all Australian shares and securities. To reflect the increased diversity of the Elders Pastoral videotex service, Farmlink and Sharelink have been gathered under the umbrella of Elderlink.

A wide range of databases provide diverse information through Elderlink. Subscribers can choose from :

- Rural news provided by the Rural Press Group
- Taxation and Management from Price Waterhouse
- Future Trading direct from the Sydney Futures Exchange
- Canberra news, reporting the latest happenings on the political front
- A wide selection of games
- First Aid, including a service by the Royal Flying Doctor Service
- National and international sports results
- Teleshopping for wines, computers, building products etc.
- Company reviews and Stock Exchange news on the Top 200 companies
- Rural information covering every aspect of Australian rural industry
- Weather — direct information from the Bureau of Meteorology covering all regions and localities in Australia
- Telex facilities enabling users to send and receive telexes from around the globe
- Electronic mailbox allowing users to send a message to one person or a hundred and one people

The most popular information accessed on Elderlink are the shares, livestock and telex areas. There are two points that make Elderlink unique. One is the up-to-the-minute livestock reports and special information providers which enable Elders to give their users a head start over the rest of the market. The other is the interactive applications programmed into the system. Elderlink claims to have pioneered new uses for the videotex terminal. Innovations designed by Elders Videotex include two-way telex which allows the user to send and receive telexes around the world and management calculators designed to address specific agricultural and business applications.

Elderlink is also the home of Australia's first electronic cashbook. Designed in conjunction with Price Waterhouse, Cashbook recognises the need to be more up-to-date in recording cash transactions, so that more time can be spent analysing opportunities and less on basic book-keeping.

Information Express

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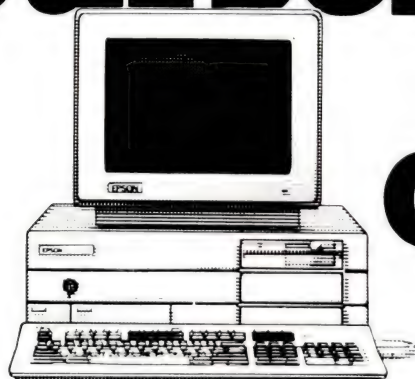
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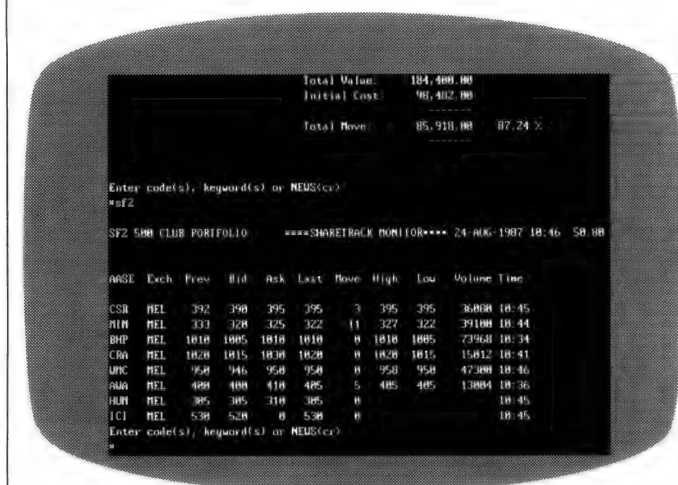
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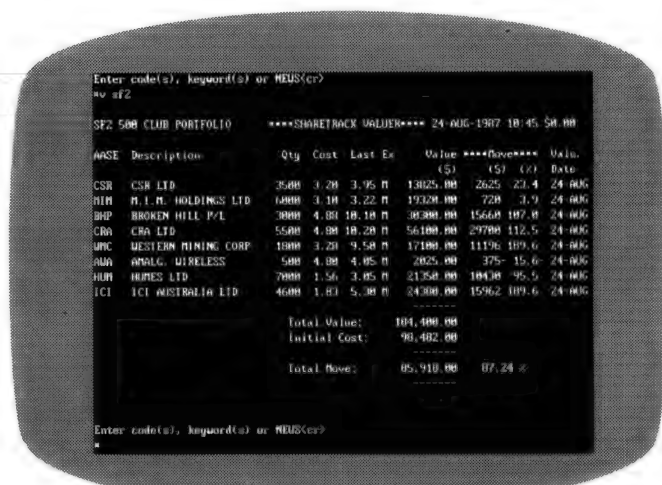
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Want to know the spot rates, trade volumes and commentaries on International Commodities such as precious metals, base metals, agricultural and resource/energy commodities from the major international markets? Information Express presents it concisely.

Because Information Express started in the database industry as AgriData it still contains an excellent coverage of agriculture. Users will find extensive market coverage of wool, grain, livestock, cotton, fruit, vegetables and flowers. Gross margin analysis reports from the National Australia Bank are available by district and by enterprise.

Subscribers also get low cost access to TELEX via their personal computer.

They can also send electronic mail ensuring instant distribution of messages or data files to individual or multiple addresses. Information Express has just announced that it can provide access to Australia Post's new E-Post network. Delivery is in hard copy within guaranteed delivery times.

"Users can create an electronic message at their PC, log-on to Information Express, upload it to our system and instruct it to be sent as an E-Post letter,"

Database file

Host: Information Express

Cost: Annual subscriptions range from nil to \$399. Six levels of service are sold with all subscribers, except for one level, paying \$126 joining fee. Connect time rates per minute or part thereof are at 55c for V21, V22, V23 for the first four hours per month. The charge then drops to 30c. Report charges average between 10c and 20c per report. Telex and E-Post charges available on request

Speed: V21, V22, V22bis and V23 Protocol: 7 E 1

Language: Keyword searches using common English words Security: A security code number and a password are issued. Passwords can be up to 40 characters long

Enquiries: Information Express Pty Ltd, 1155 Malvern Road, Malvern, Vic 3144 or phone (03) 209-2222. Toll Free (008) 33 8806

Robert Utter, electronic publishing manager says. "It can go as an overnight letter through normal postal delivery, or as a two hour courier delivery in metropolitan areas or major regional centres."

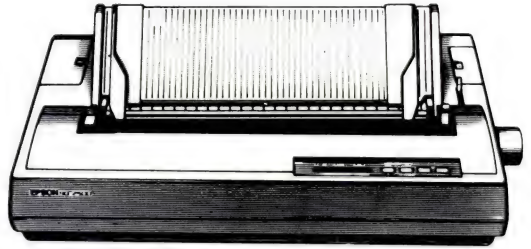
Online review

When you log-on to Information Express the first on-screen message will advise you whether you have mail waiting. It was 10:05 am on July 24 when I started this review. The morning newspapers had just announced that Melbourne's Channel Seven was expected to be sold to Christopher Skase. 'News Alert' reported this along with 'Surprise Bid For Elders', 'Home Loan Rates Tumble' and 'National Sharemarket Report.'

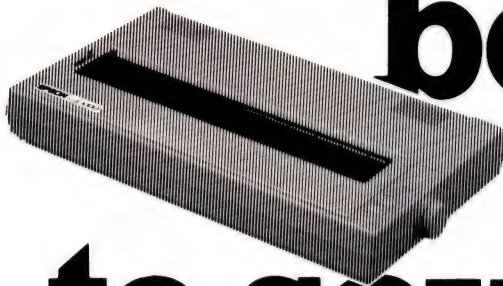
Entering the code number alongside the Elders news item brought the five paragraph story to the screen from the Presscom National News Service. Using the command 'Exchange.Rates' located 35 reports followed by a report menu. Selecting 'ANZ Interbank Australian Dollar Exchange Rate' produces a table giving interbank exchange rates for transactions between banks in amounts over \$A3 million. Rates are continually updated by the foreign exchange trading room, Australian Treasury. Eighteen world currencies are reported, including the US and Canadian dollar, the Japanese Yen, the Hong Kong dollar and the British pound.

Time now to go into the Stock Exchange area and to see how the Broken Hill \$1 shares are being quoted at 10:11 am. Sydney and Melbourne prices are given for Previous, Bid, Ask, Last, Move, High, Low and Volume. At 10:10

As of now, there's no



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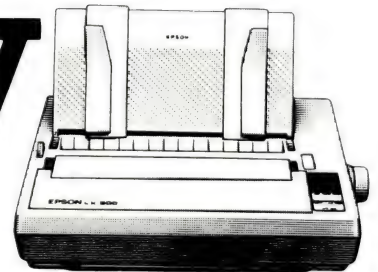
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am 52,400 were sold on the Sydney Exchange at \$10.55.

Since a friend took up Rupert Murdoch's convertible notes offer at the time of the takeover of the Herald & Weekly Times Ltd, it seems time to check on their performance. Information Express reports that the price has fluctuated from a low of \$19 on May 1 in Melbourne, to a high of \$21.50 in Sydney on April 23.

Still in the Stock Exchange area, a search for 'active media' selects seven securities ranging from Advertiser Newspapers to Universal Telecasters. Another command gives a table packed with information on all the shares nominated. Fairfax shares have been active with 189,000 being sold at 10:15 am for \$4.70. Pro-Image Studios have traded at \$2.40 for 20,700 shares.

As another test of this global searching via a keyboard, I decided to check out the prices on the New York Cotton Exchange. These reports are becoming increasingly popular with local cotton growers. A table quickly tells the opening, high, low and last price and the change for a number of months.

Back now to local finance news and I set up the search for 25 news items. The item 'Fairfax Backs FM Licence Push' catches the eye. Key in the code number and I find it is a report from that day's Brisbane Courier Mail (although the keyboard operator has re-located the paper to Melbourne...very confusing.) Fairfax, through Universal Telecasters, are among the heavy-weight media groups backing applicants for a Gold Coast FM licence. Their involvement is through the aptly named Shine on FM Pty Ltd.

Entering the command 'Lambs' produces a report menu offering a choice of 21 market reports from around Australia. They range from Katanning and Dalby through to Gunnedah or Dubbo. Choosing Homebush, I discover that rain disrupted the supply of lambs to yesterday's market and new season's lambs were firm to 50c dearer. A table presents average prices and a range for five categories of lambs by weight and the skin value.

This visit has shown me that Information Express lives up to its claim of being Australia's dynamic dial-up business information and communications service.

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The I.P. Sharp data collection began in Toronto, Canada in 1970. Now it spans the globe with 60 million time-series of data available in four major areas:

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tion, futures and commodity markets, money market and financial rates, and currency exchange rates for several world markets, plus Euro-currency rates. Equity prices for over 50 exchanges around the world are also available. There are nearly 30 databases to choose from.

Energy data

Its online information on international energy data gives the latest crude oil, petroleum product and petro-chemical prices from around the world. Over 110 databases offer such diverse information as Australian Major Energy Statistics to the Seismic Crew Count from the Society of Exploration Geophysicists.

Aviation

The eight aviation databases are a unique feature of the I.P. Sharp service. There are details on about 400 airlines and 300 airports worldwide. Here you will find the official Airline Guide which offers the operating schedules for regularly scheduled North American and international certificated carriers or the US International Air Travel Statistics.

Robyn McConnell, I.P. Sharp's national database manager, reports that international database usage is growing rapidly each year. She attributes this in part to the accuracy and timeliness of the data, and to the fact that I.P. Sharp can provide individual solutions for specific problems. Downloading data into Lotus 1-2-3 and Symphony opens up extended possibilities for spreadsheet analysis.

More than 95 per cent of the I.P. Sharp data is in the form of numeric time-series, such as monthly consumer price indices, daily stock prices or weekly jet kerosene production figures, which all undergo constant changes. Daily data updates from more than 100 sources are received and are fed immediately into the databases to ensure accurate and timely information.

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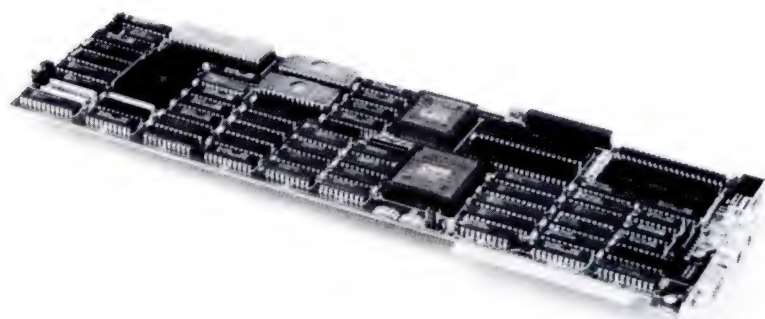
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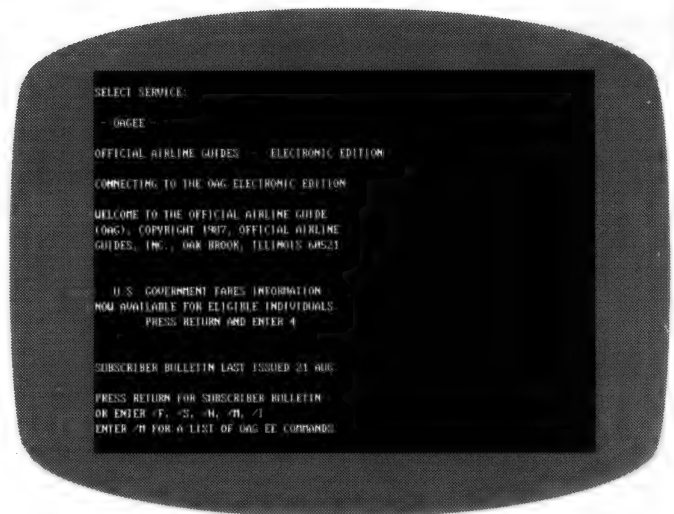
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INFORMATION



Microtex, a database for PC users on Viatel

I.P. Sharp's Official Airline Guide (Electronic Edition)

publicly available business information under the name Infoservice. Infomagic, a system for accessing more than 500 pre-formatted reports on finance, economics, energy, aviation and world news is one customers can then choose from. The most frequently requested data I.P. Sharp supplies is in the range of information available through Infomagic.

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Magic, which I.P. Sharp claims is widely used in government departments and the finance industry, is a most comprehensive system for retrieval, manipulation, analysis and report formatting of the entire range of data available through Infoservice.

Viatel

The Telecom videotex system, based on the Prestel system of Britain's Telecom, now has over 20,000 subscribers to this information source. Telecom reports that there are now over 200 organisations supplying information and services as providers.

The Viatel database contains over 85,000 frames of information and is the medium used to transmit over 75,000 messages in transit per month. While

Viatel manages to cover an extraordinary range of subjects, you can't help thinking as you look at the small amount of information on each frame, that it is the Reader's Digest type approach to a true database. However, if you want to know a little bit about subjects ranging from accommodation, through family history, national news to zoology, a Viatel subscription might interest you. There are 506 entries in the subject index listed in the latest issue of the Viatel directory and magazine. This probably explains why Viatel is the fastest growing videotex service in the English speaking world.

Viatel offers subscribers an extensive selection of information from news, lottery results, weather, travel information, latest figures from the Australian Bureau of Statistic, sports results to Stock Exchange reports. In many subject categories there are a number of service providers vying for the chance to charge you to read their frames. Airline timetables or advice on courses available from nine universities or colleges are all included on the plethora of product information being promoted.

Major services available on Viatel include Money Watch, a stock, share and financial information service operated by John Fairfax/David Syme; Commonwealth Bank — electronic banking, Western Australia TAB — Electronic Teletotting and Microtex 666 — computer programs and information.

Money Watch brings the latest share prices from the Sydney and Melbourne stock exchanges within minutes of sales being recorded. Every half hour, it also shows how the Dow Jones industrial index is moving. Key US fu-

tures and commodities market information appears almost as it happens.

Because over 75 per cent of Viatel users access the system using a personal computer there are a lot of businesses aiming their sales pitch at them. Communications equipment and software, books, clubs, courses, hardware, news, peripherals, repairs and service are all among the subject indexes containing well-known names like Apple, Dick Smith Electronics, Hewlett-Packard, Microbee, Microtex 666, Nashua, NetComm.

Games are also big news on Viatel with adventure games, logic games, multi-user games and sporting games all competing vigorously for the attention of the keen player. Late last year Viatel achieved the distinction of running the Atlantis International Great Galactic Conflict, the largest computer game in the world. Run by Microtex 666, the game is the largest multi-user computerised game, with the ability to enable up to 1000 players to join in.

Teleshopping is another important part of the Viatel service with a wide range of goods and services available for instant ordering. Users can choose from items including agricultural equipment, the euphemistically named 'adult products', alarms, books and magazines, car accessories, satellite receivers and typewriters.

The range of activities covered by a diverse group of new service providers who have come online in recent months, seems to indicate the increasing acceptance of Viatel. There's the Australian Psychological Society offering general and professional information about psychology and psychologists. Age Info Services is a one-stop

Database file

Host: Telecom Viatel

Cost: Subscription fee —

**Business \$12.50 per month,
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**Monday — Friday 8am — 6
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**Charge per page : applies at the
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**providers. Indexes and many
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messaging, are chargeable**

Speed: V23

**Protocol: A videotex
communications software
program will be needed**

**Security: A customer identity
number and a personal
password are issued**

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newsbank backed by the resources of The Age, offering summaries of the most recent Age articles on business, educational and general topics of high public interest. ACER is the Australian Council of Educational Research. Its service lists council members and describes current research and development projects and areas of education with which ACER is involved. Celebrity Sports is a catalogue of videos and books for sale on popular Australian sporting and business subjects.

Keylink

Keylink is the new national and international electronic mail service and communications system. It has been made up by the merging of the OTC Minerva and Telecom Telememo services. Through being part of the Dialcom network it can provide links to the USA and Britain. Keylink also enables two or more users to have direct links and provides access to a bulletin board.

Major OS databases

BRS Online is the Bibliographic Retrieval Service and it can give you access to databases covering a wide range of interests. The software used

by BRS/Search has rapid and flexible search capabilities. The range of databases available range from AIDS Update through Magazine Index to Sport. The company has been one of the major providers of databases to businesses, libraries and universities in the USA. Its address is BRS Information Technologies, 1200 Route 7, Latham, NY 12110, USA.

The CompuServe Information Service is another popular host for a big collection of databases. If you absolutely have to have access to the A-Z Worldwide Hotel Database, the Las Vegas Hotline, Shareholder Freebies or The Tardis Times then you sound as if you need to join up with CompuServe. Its address is Compuserve Information Service, 5000 Arlington Centre Blvd, Columbus, OH 43220, USA.

DIALOG is another large USA host which offers a wondrous choice of hundreds of databases. It has an Australian office and you can contact it by writing to Insearch Ltd/DIALOG, PO Box K16, Haymarket NSW 2000 or phone (02) 212 2867. Choose from topics including Agri-business, Child Abuse & Neglect, Computer Database 1983+, Coffeehouse 1973+, Online Chronicle 1981+ or World Affairs Report 1970+.

The oldest national online host aimed at the general public in the USA is The Source. It was the first American service to go online in 1979 and was developed by the Telecomputing Corporation of America. The Readers' Digest Association purchased it in 1980. You'll find databases as diverse as Artificial Intelligence Network, Comp-U-Store, Donoghue, Newsbytes and The Kaypro Knews on The Source. Write to it at Source Telecomputing Corporation, 1616 Anderson Road, McLean, VA 22102 USA.

Another USA based host with Australian representation is ORBIT from the Systems Development Corporation. The SDC range of databases includes Chemdex, Corrosion, Enviroline, Forest and US Patents. You can write to ORBIT Search Service at PO Box 439, Milsons Point, NSW 2061 or phone (02) 692 8565 or Toll Free on (008) 22 6474.

Database database

Whether you are seeking information on a popular or rare subject, it is almost certain to be covered in a database somewhere in the world. Knowing where to start searching is the key to acquiring information.

The Australian Database Development Association was formed in 1982.

Database file

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Security: A customer identity

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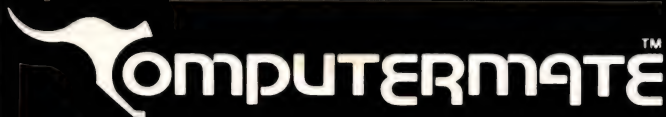
Enquiries: Contact the Keylink

Hotline office by phoning toll

free on (008) 033 494

It represents both public and private sector organisations directly involved in the development or the provision of access to publicly available databases. The ADDA publishes a regular newsletter for over 300 members and also publishes the 'Directory of Australian Databases'. The third edition of the Directory is expected to be published around December 1987. The price is yet to be determined, but will be around \$60 to non-members. The second edition contains information on over 180 publicly available Australian databases. Contact the ADDA at PO Box 53, Hawthorn, Victoria 3122 or phone the chairman Ms Diana Killen at (03) 20 5334, or the secretary Ms Sherry Quinn on (03) 541 5600.

Another invaluable source to use is the aptly named 'Recipe Book Service of Online Searching', published by RD Williamson & Associates Pty Ltd, PO Box 33, Kew Victoria 3101 or phone (03) 818 7238. This is a unique guide to Australian online information services and to those overseas online information services that are represented in Australia. This pioneering work is now in its eighth year of publication and an annual subscription costs \$70. Subscribers receive a convenient A5 size ring binder set. The Recipe Book gives



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INFORMATION

step-by-step instructions for using 34 different online services. A comprehensive list of the information provided by each host system and a glossary of useful terms and abbreviations are there too. Each July, a completely revised edition is issued to all subscribers and in January an update set of individual pages on which changes have occurred is issued.

Once you enter the international search for information you will find the 'Directory of Online Databases', published in the USA by Cuadra/Elsevier, New York to be an indispensable tool. The Directory is designed to keep subscribers abreast of the vast amount of information contained in online databases worldwide. In January and July two large issues of over 500 pages are published each year with two updates in April and October which just contain the changes which have taken place in the previous quarter. The latest edition contains details of 3507 databases ranging from Australian Tourism to Zoological Records Online.

There is information on 1593 online services, 1568 database producers and 44 gateways. Address enquiries to the local agents, Australian Information Retrieval Services Pty Ltd, Suite 30 456 St Kilda Road, Melbourne Vic. 3004 or phone (03) 266-4590.

Providing Australian information to the world

Late in June the then Minister for Trade, John Dawkins, launched the OTC publication The Australian Database Directory which lists all publicly accessible databases available across the country. This directory is only available to researchers and business executives overseas, it is not available for issue in Australia.

"It is not merely a directory of databases . . . but rather a significant step in accelerating the development and export earning capacity of the Australian information industry," Mr. Dawkins said. "Information is the key to our success — and telecommunications the means by which this information is carried to the people who need it."

"If we are going to compete in the modern world, we've got to use modern methods, and so regular searching of online databases is now imperative for any researcher, financial controller or marketing manager. OTC has also taken the initiative in reversing the flow of information into this country — in staking our claim in the world as an information provider."

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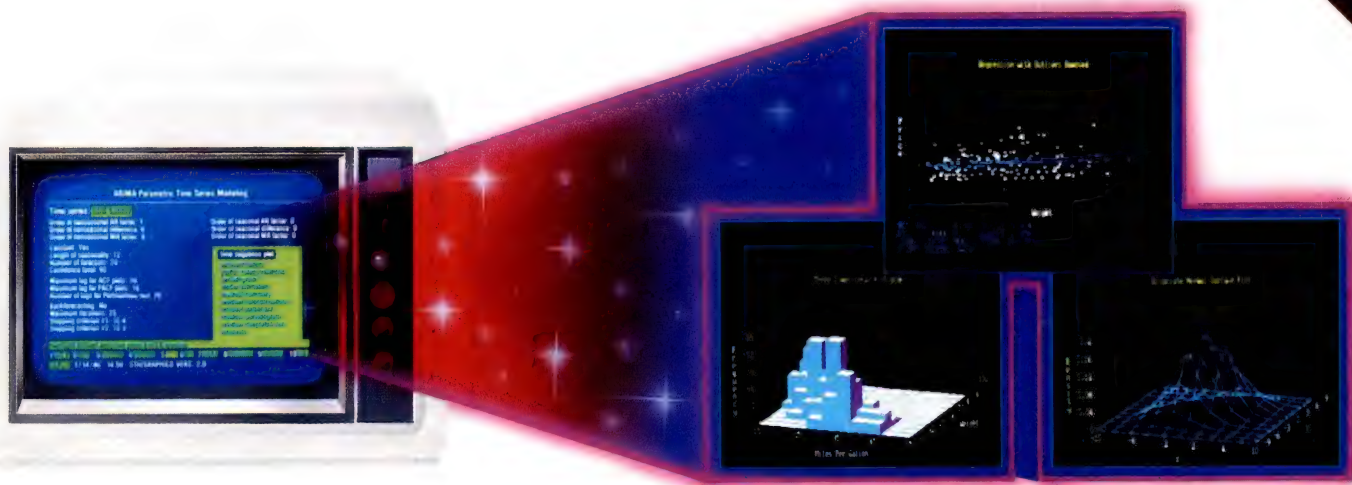
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The ideal bridge

Users who must extend the reach of their networks may discover it's not so easy to find the appropriate bridge that will link two networks. There aren't many bridges available for specific local area networks (LANs), because bridges are usually developed by the LAN developer: they're specific to that LAN.

When trying to choose the right bridge, it's best to consider the LAN for which the bridge is intended.

Part of the challenge facing network managers is deciding what constitutes a bridge. The definition of network bridge has evolved. It used to mean any method of connecting two or more networks. Today, that definition is too general. A more precise one would be: a network bridge is a method of connecting two or more discrete, like networks, allowing nodes on one network to communicate with nodes on the bridged network.

'Like' is the key word in that definition. It means that each network runs the same network protocol, such as NetBIOS-to-NetBIOS, Novell IPX-to-IPX, 3Com-to-3Com. It does not necessarily mean that the bridged networks are using the same network-interface boards or hardware protocols; it is perfectly possible, for example, for a bridge to link a network based on Ethernet hardware to one based on Token-Ring hardware, so long as they both use the same software protocols. A bridge does not address the lower levels of the open systems interconnection (OSI) model that deals with hardware and hardware drivers, except that the bridge itself is a functioning node on each network.

A bridge usually consists of a computer or dedicated device with network interface cards to both networks. The bridge software resident in the bridge computer handles the transfer of network data packets from one network to the other.

To connect two or more networks of dissimilar network protocols — such as IPX-to-SNA and NetBIOS-to-TCP/IP — a gateway is needed. A 'gateway' is a connection between dissimilar devices, and combines the functions of a network bridge and those of a protocol

converter between the different network protocols.

There are a number of reasons for bridging two independent networks rather than merging them into one large network. The most obvious one is different hardware configurations. One large network cannot be formed by connecting a collection of PCs running Novell network software (IPX protocol) and equipped with IBM Token-Ring hardware directly to a Novell network running on AT&T StarLAN hardware. These networks must be bridged.

Limitations

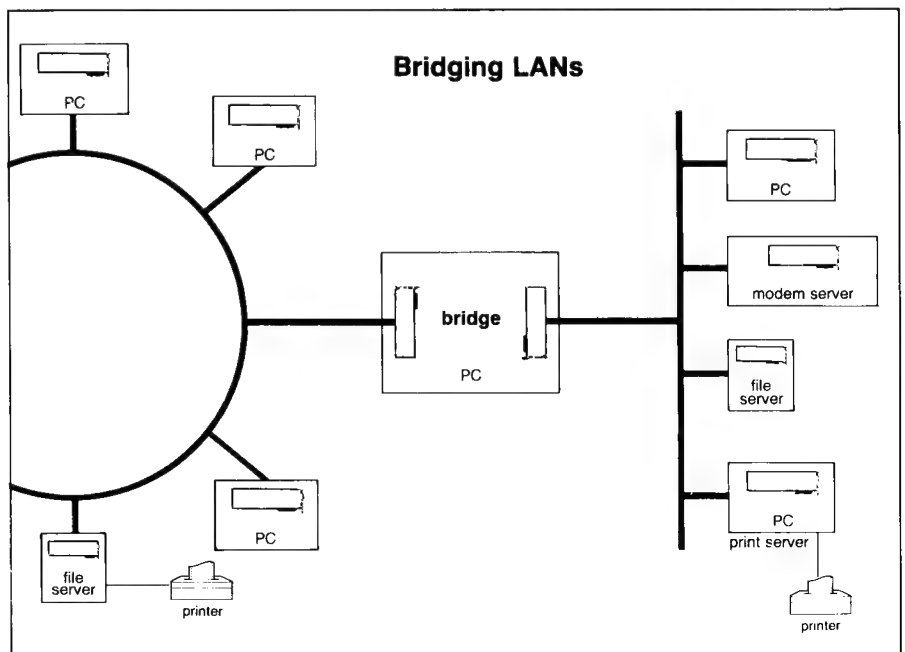
Another important reason is to overcome the many physical limitations. An IBM Token-Ring Network can only have 260 devices on a ring. A Gateway G-Net network can only ex-

tend 4,000 feet with coaxial cable. Once a network has reached any such physical limit, additional nodes cannot be added. The only way to expand it is to break the network down into smaller networks.

Functionality at times dictates the use of a bridge. Large organisations often use many discrete networks having independent functions.

IBM call these networks 'affinity groups'. Sometimes independent affinity groups need to share expensive or limited resources between networks, a mainframe gateway or a PC-based facsimile-transfer system, for example. Rather than duplicate these resources on each network, the networks can be bridged, giving workstations on one of the networks access to the resources attached to the other.

Even if such affinity group networks have not reached their physical limits



in terms of workstations or cable length, their performance may deteriorate. As networks grow in physical size or are put into more use, the amount of data flowing over them increases and the demands of each user are responded to more slowly.

Networks using CSMA/CD (carrier sense multiple access/collision detect) technology, such as Ethernet networks, are subject to more collisions and retransmissions. Nodes on token-passing networks are subject to longer and longer delays in receiving the 'token' as the number of stations on the network increases.

Therefore, an important reason for bridging networks is to increase performance. A bridge can make a large network into several smaller networks. Within each network, the amount of traffic is low enough for response time to be acceptable, and since most of the communication is between the workstations and network resources of members of the affinity network, there is little data that needs to cross the bridge.

There is some speed lost in crossing a bridge, due to the overhead of the bridge itself. But data crosses the bridge only rarely, on those occasions when a user on one side of the bridge needs a resource or data that is on the other.

Consequently, if the network designer splits the networks along the lines of affinity groups, where devices that communicate frequently are on the same network, then a considerable performance increase can be expected by bridging.

Geography is yet another factor dictating the use of bridges, when two groups of users in two separate locations want to be able to communicate with one another as if they were nearby. Remote networks can be bridged using intermediate media.

One form of intermediate media is a backbone network. In this case, the backbone network is a LAN without any workstations as nodes. The only nodes are bridges to other networks (see chart). The backbone is usually a network capable of long distances such as AT&T's ISN acting as a media to connect bridged LANs such as AT&T's StarLan network.

Other intermediate media include telephone lines or the higher speed T-1 carriers. Compared to a direct, network-speed connection between the networks, using telephone lines (either synchronously or asynchronously) significantly reduces throughput through the bridge. Even a T-1 carrier subchan-

nel at 56k bits per second (bps) is much slower than the 1M bps of the slower LANs. Using telephone lines for remote bridging is therefore effective only for limited uses, such as network administration or electronic mail.

Besides choosing an appropriate telecommunications link, network managers must also consider what type of hardware is needed to perform the bridging function.

Performance dictates the type of machine necessary to function as a bridge. A bridge between Novell networks can be anything from a simple, single-disk 4.77MHz PC on up. IBM requires an AT or a 7530-series Industrial Computer as its bridge on its networks. Companies like 3Com or AT&T offer a dedicated 'black box' as the bridging device with hardware and

'...users on one side of a bridge may not be able to gain access to an unlimited number of resources on another LAN on the other side of the bridge.'

software bundled in one package. These boxes have network interfaces built in.

A question of dedication

The necessity to constantly monitor traffic on both networks, and pass internetwork packets through as quickly as possible, dictates that bridges tend to be dedicated devices; that is, they only function as bridges, and are not used simultaneously as network workstations. These dedicated bridges are known as external bridges. Another type of bridge is an 'internal' bridge, which functions the same as dedicated bridges, but resides in the network server.

Novell and its OEM distributors offer both internal and external bridges. One advantage of the internal bridge (created by configuring a network server with multiple network interface cards and device drivers, each dedicated to a different network) is that, in addition to acting as a bridge, the server can directly 'serve' multiple networks as well.

When choosing a bridge, price is always a consideration. Some vendors sell the bridge software at a fixed

price. Others determine the bridge price by the number of networks connected by a single bridge. Novell includes their internal bridge in the price of the network, while charging for external bridge software.

All multiple-bridged networks (that is, more than two discrete networks linked together by bridges) have either a hierarchical or mesh topology. The hierarchical topology provides only one path, via intermediate networks, between the source and destination networks. Each network is linked only to the network adjacent to it. If three networks are bridged together, a network data packet from network 1 must pass across a bridge to network 2, then through that network and across another bridge to get to network 3. Only one route is possible, and network 2 will always be the intermediate media.

On the other hand, a mesh network allows for alternative paths for network traffic, giving a packet from one end to the other more than one possible data path. The packet from network 1 can pass to network 3 as described in the hierarchical scheme, or through an alternate path if there are other bridges between networks 1 and 3 — directly or through yet another intermediary network. Where performance and fault tolerance are important factors, the mesh topology is the solution. Where internetwork traffic is not heavy and the application can tolerate some downtime if the bridge malfunctions, then the less-expensive hierarchical topology is the answer.

Single bridges, the building blocks of either hierarchical or mesh topology, come in three types: simple, simple-multiple and parallel. The simple bridge consists of two networks joined by one bridge. This is an effective way of joining two networks that exchange limited information or share limited resources. The networks should be configured so that most of the network traffic remains on the originating network, rather than crossing the bridge.

Simple-multiple has all the features of the simple bridge, but allows more than two networks to be spanned by a single bridge.

A parallel bridge consists of two bridges, connected to the same networks, providing for redundancy, hence greater reliability, in networks with higher traffic and need for fault tolerance. Should one bridge fail to function, the other bridge is still available. Network managers could also split the traffic between the two bridges to smooth the flow of data exchange.

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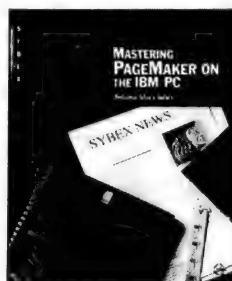


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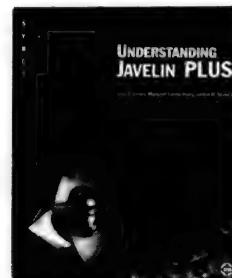


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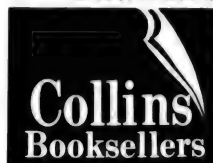
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There may be limits to the number of parallel bridges that network topologies allow. IBM Token-Ring, for instance, allows a maximum of 16 parallel bridges between any two rings.

Software-sensitive

In addition to topology, performance and price, there are other factors to be aware of when selecting a bridge. Although bridges connect networks of like protocol, they may be sensitive to versions of the network software. For example, while the IBM bridges on both Token-Ring or PC Networks can effectively connect networks running PC LAN version 1.1 and version 1.2, Novell's bridges cannot connect a network running Advanced NetWare version 2.0 or version 2.0a to version 1.0 or the soon-to-be-released 2.1.

Another important factor in selecting a bridge is the type of traffic that may cross the bridge. Not all networks allow all devices on the network to access bridged networks.

In some NetBIOS bridges, the bridge itself maintains a table of node names for each bridged network. This table

has a limited size and, therefore, there is a limit to the number of devices that may be reached across it. Thus, users on one side of a bridge may not be able to gain access to an unlimited number of resources on another LAN on the other side of the bridge.

Besides the limit on the devices that may span the bridge, certain software may not span it. For example, most applications on a 3Com network may cross the bridge, but 3Com's SNA gateway software works only with gateway hardware attached to its resident network. The software is unable to make use of SNA gateway hardware that is located on another 3Com network across a bridge. The same limitation is true for IBM's bridge, with its 3270 gateway.

Although most networks allow network nodes to redirect or spool output to printers on the other side of the bridge, it is necessary to examine application software to determine if they can. Packages such as Lotus 1-2-3 or dBase III Plus that write directly to the LPT or PRN devices work fine when these ports are redirected to a network device, and the redirected output crosses the bridge.

On the other hand, many 'network' applications, such as those of WordPerfect or MultiMate word processing software, redirect their own printer output by placing the appropriate network software calls. Because these packages were not written with bridges in mind, they cannot make use of printers that are on another network across a bridge. One way to solve this problem is by avoiding the use of these packages' network printer features and directing the output to an LPT or PRN device that has itself been redirected across the bridge.

If a LAN is already in place, the bridge selection is limited to the bridge compatible with the installed network. If the network installation is new, the bridge should be one of the factors affecting the selection. Determine the ideal bridge based on performance, geography and cost. Determine the number of devices and type of applications that will cross the bridge. Finally, make sure that the LAN purchased has a bridge that will serve these needs.

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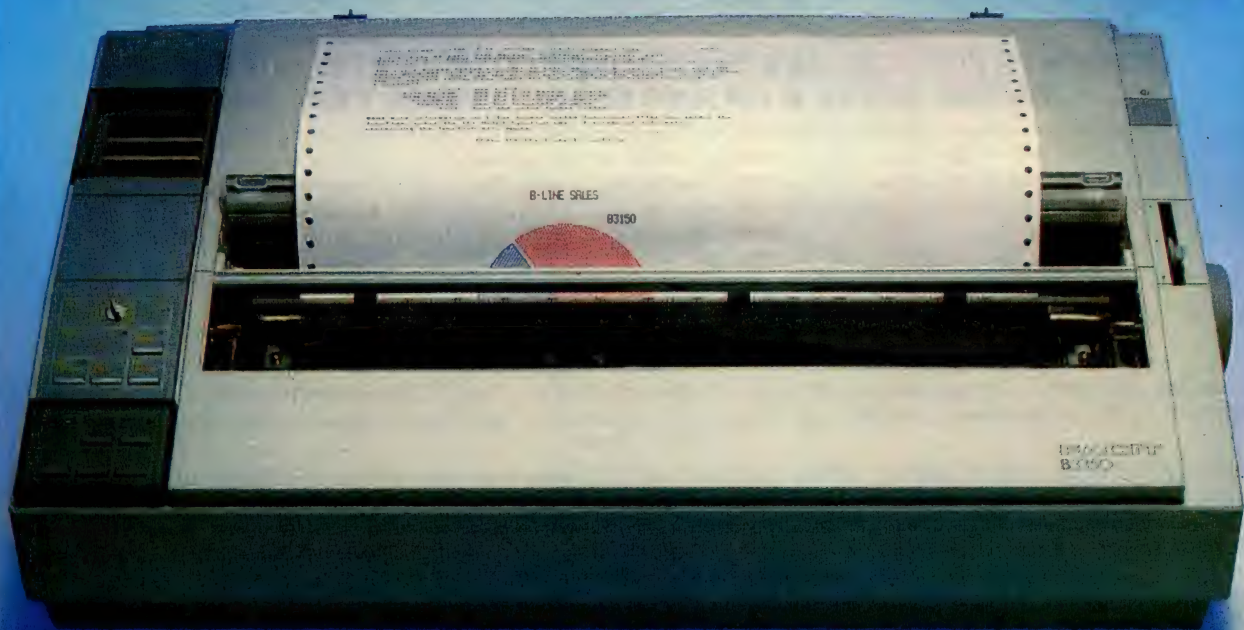
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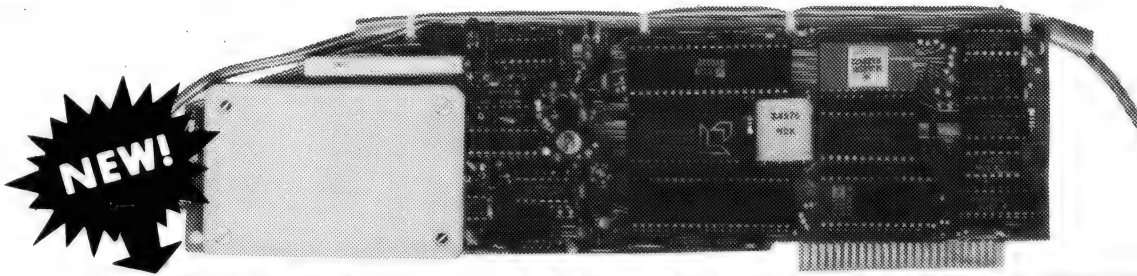
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Bridging LANs

As users implement larger and more complex local area networks (LANs), a number of limitations have become apparent. Ian Davies explains. Next month's connectivity column will feature a chart showing specifications and prices of networks capable of forming bridges.

Two of the greatest limitations in LAN implementation are the number of devices connected to the LAN and the physical distance the LAN may cover. As the number of devices connected to a network increases, the percentage of potential throughput consumed by network overheads starts to increase at a higher rate. This imposes a practical limitation on the number of active devices, and may make system performance extremely variable.

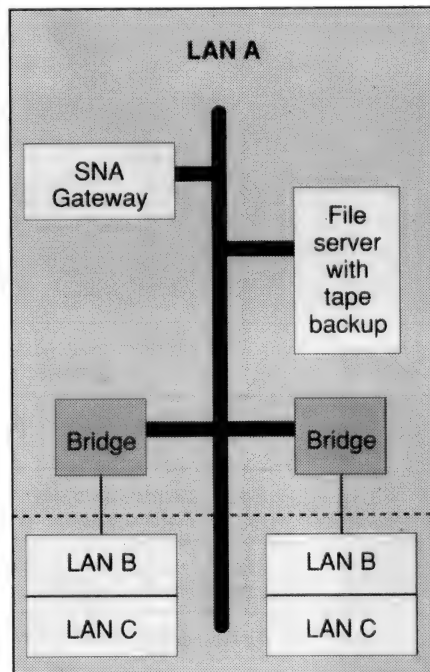
Traditional cabling imposes a restriction of several hundred metres, or at best, a little over a kilometre on the distance from one node to another. The wide area network (WAN) approach, presents its own problems, and is not always appropriate as user populations may be clustered in small communities physically removed from one another. Alternatively, it may be that within an organisation several LANs have grown within separate groups, and a need arises to share resources. These LANs may even be based on different technologies.

A solution to these problems lies in the area of 'bridged LANs', where the user community is served by a number of smaller LANs which are then interconnected via a series of bridges. Each component LAN is configured to be well within the distance and node limitations of the LAN technology being used, and traffic planning is done to ensure an evenly distributed load.

Bridges are conceptually a 'black box', although may physically consist of a normal PC with two network adaptor cards installed and appropriate control software. The two network adaptor cards may even be of different types. Other bridges are standalone units

based on custom hardware. The bridge monitors the network traffic on each LAN and is responsible for passing data from one LAN to another.

It sounds like one of those ideas which looks great on a white board but presents all sorts of problems when it comes to physical implementation.



However, user experience indicates that the bridged LAN approach works well.

One of the largest LANs in Australia is implemented by Telecom for its own internal use. Based on the Ungermann-Bass products distributed in Australia by Data Bridge, the network consists of twelve separate LANs in twelve dif-

ferent buildings. Each building's LAN is interworked to the others via an Ungermann-Bass bridge. The entire system spans the Melbourne CBD, from Spring Street through to William Street, and involves more than several kilometres of cable. British Telecom apparently has a similar network, involving the use of 60 bridges.

The Telecom network is around twelve months old, and is still in its embryonic stage as far as user population goes. Yet, according to Col Browett, a member of the Telecom Business Terminals Branch project team responsible for installation and user liaison, the system is already working well with around 100 users in total. A baseband Ethernet system is used within each building, running at the rate of 10Mbps. The UB bridges provide a 2Mbps link between each LAN, active at ISO layer five and providing intelligent routing. This means that traffic is passed outside of the local LAN only when really necessary, maximising the throughput of the 2Mbps link and insulating the interworking from high volume local traffic.

Telecom says that the performance so far is 'virtually instantaneous', but acknowledges that the user population is currently quite small. It is planned to eventually support over 1000 users in total. Although some degradation is expected, the ability of the bridges to perform intelligent routing leads Telecom to expect reasonable performance even with that user load.

Ungermann-Bass Buffered Repeaters are used to extend the physical scope of the network. These repeaters sit between the more distant bridges and relay packets of data over lengthy

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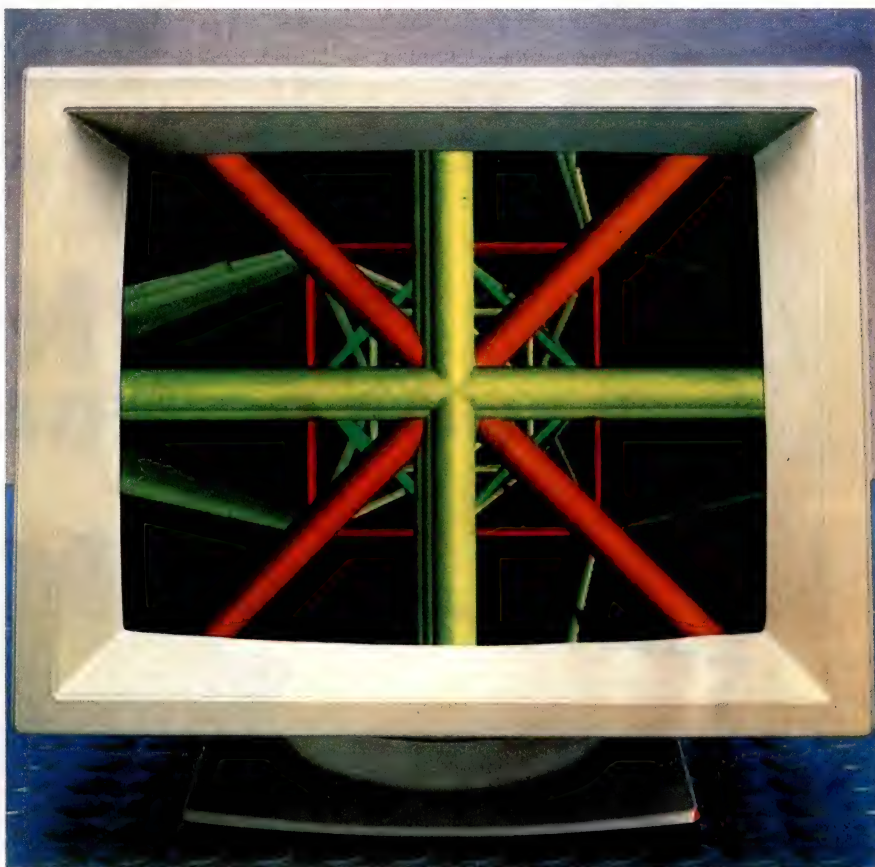
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stretches of cable. The repeaters also have a degree of intelligence, verifying packet integrity automatically.

Col Browett finds the network very easy to use, and says their biggest headaches to date have merely been ones of logistics. He adds that Telecom started out with virtually no in-house experience of this technology, and the entire process has been on a learning curve. This has resulted in a number of small scale problems, but all due to the learning curve and not the technology itself.

Telecom's need for bridged LANs becomes obvious when related to its organisational structure. Telecom occupies over 35 buildings in and around

the Melbourne CBD. An individual group of users may be scattered throughout these buildings, depending on what other groups they interact with. In addition, most groups have a need to access the Facom and Honeywell main-frames, as well as a bevy of minicomputers.

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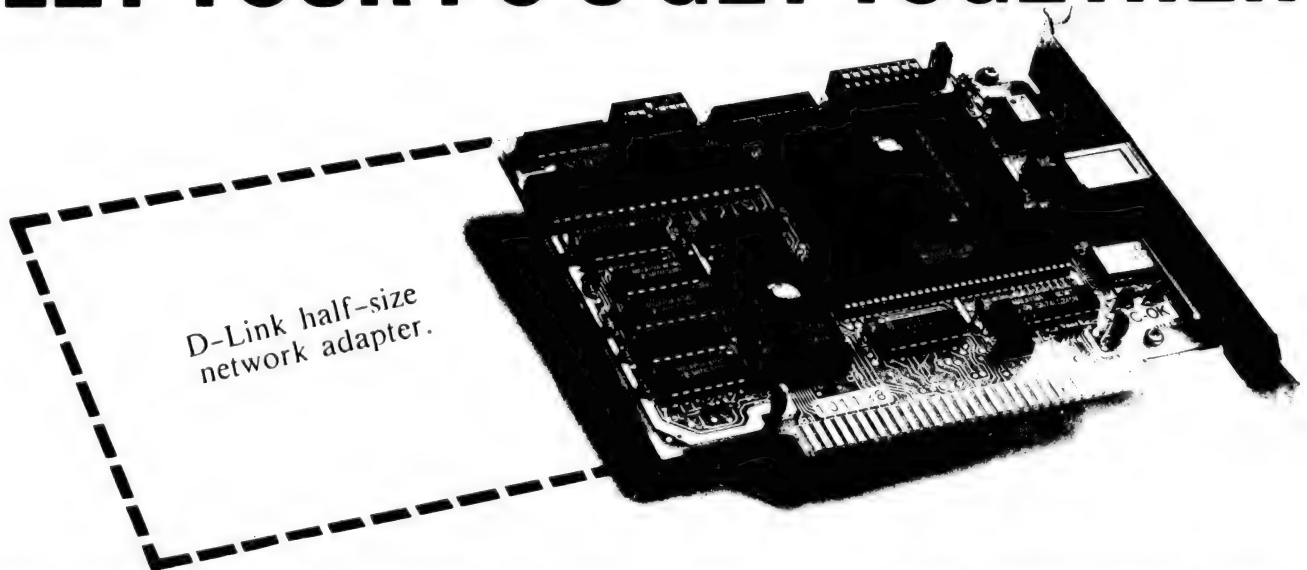
Through the bridge, users may engage in file sharing, electronic mail, bulletin boards, host access, printer

sharing and Austpac access through an X.25 link. Users do not need to know the physical location of a resource, merely its name. The bridge recognises remote resource names and broadcasts the requests throughout the external net. The entire system is administered by a Sun minicomputer running UB network control console software under Unix.

Although the Telecom project team was originally set up as a temporary entity to manage the installation of the bridged LANs, it now looks as if the growing user population and diverse requirements will demand a full-time support group.

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DESQview

Now that multi-tasking is finally becoming a reality, DESQview's innovative form of 'partitioning' will appeal to anyone who wants it now — rather than later, in the shape of OS/2. Owen Linderholm assesses the product's capabilities.

Quite possibly you are sitting reading this article in front of your PC waiting for a long operation to be performed, like recalculating the accounts spreadsheet or compiling your newest program. Naturally, since you can't use the PC while this is going on, you pick up *APC* to keep up with the industry and you start to read and dream about OS/2. If that were available, then you could switch to a new task and carry on working on something else.

Here's some exciting news; you could be working *now* even with a humble 8088-based PC. The program that allows this is DESQview 2.0 from Quarterdeck, an American software house.

The view from the round window

DESQview is essentially a resource manager for your PC. It starts from the assumption that you want to use a number of programs on the computer *simultaneously*. Normally this would be completely impossible since both programs would need to use the same bit of memory at once or write to disk at the same time. If you imagine trying to watch two programmes on TV simultaneously, then you will get some idea of the difficulty. The two TV programmes will both be trying to send conflicting information to the screen and speaker at the same time and the result will be a real mess.

Trying to get two computer programs to run on a PC at the same time is even more complicated since there are far more things that the two programs will need access to.

DESQview must manage all of the resources like the screen so that such conflicts do not arise. It does this by



DESQview 2.0 in action. There are several ordinary DOS windows open in the background, each with 128k available to it. Other open applications are available after a couple of keystrokes and include WordStar and ProComm. The main DESQview menu is at the top

partitioning each program in its own area of memory which it is not allowed to break out of. If programs need to write to the same part of the screen, then DESQview only allows one of them to display at any time and the user has to switch between them. With many programs, this is the only way they can be run under DESQview. In this case, DESQview is simply switching the programs about and the user sees this as something like switching channels on TV; just switch over and you are immediately back in the middle of another program.

However, DESQview *can* be cleverer than this. Let's get back to the TV analogy for a fuller picture. There is one way that two TV programmes can be shown at the same time on a TV set. This is to put one (or more) pictures in a box within the full screen. Although this obscures part of the main screen, if carefully placed, the boxes can let you see two things at once without losing any important parts of the picture. Some of the more recent TV pop programmes do this quite a lot and I have seen up to five inset boxes on the screen at once. New digital

televisions actually manage to have a postcard inset near the top right hand corner of the screen which can display a different channel or perhaps a video player input. So you can watch *Gone with the Wind* with the Adelaide Grand Prix playing in the postcard size inset (it actually produces a remarkably clear image — at least on the demonstration version I saw in Grace Bros). Back to the subject . . .

DESQview does something similar with computer programs. As long as a program is known to be 'well-behaved' and one that won't try to break the operating system's rules, then DESQview can display it in a window on the screen. This window can be any size, from one character to the whole screen. Information inside the window can be scrolled around and the window can be resized and moved about.

DESQview can also actually have more than one program running and operating at the same time as long as it can fit them both into memory. It can have lots of programs ready to run, but if they don't fit in ordinary memory then they need to be swapped in and out from disk or extended memory.

To do all this, DESQview needs to be

able to manage the processor and memory very carefully. It is a fairly simple matter to shove programs into separate areas of memory and even to prevent them writing data to other areas of memory where other programs have been stored. This is done by having DESQview take over most of the operating system. It intercepts all the calls that a program makes to the processor and data bus and decides whether to let them through, stop them or to modify them to go where DESQview wants them to.

Obviously memory management is an important function of DESQview, but even more important is processor control and multi-tasking. DESQview is essentially a sort of parasitic control program that squats on top of the operating system and controls it so that more than one program can run at once. DESQview also dynamically determines how much of the processor time each program running under it gets. It monitors the passage of time and every now and again — every few hundredths of a second — it switches control from the current program to another on its list. This is known as time-slicing and allows a single proces-

sor to run several programs by giving each one a short turn to run.

When DESQview switches between tasks, it needs to save the status of the processor, registers, stacks and other areas of system memory. If there is insufficient memory when it starts a new task, it also needs to switch one of the old tasks out of main memory and save it somewhere in temporary storage. This can either be expanded memory or a cache on disk that DESQview manages itself. This process is almost instantaneous when swapping to or from expanded memory, and very quick when swapping out to a hard disk.

Even allowing for the huge overheads involved in switching whole programs back and forth, managing and saving memory, registers, program stacks, and so on, the processor can manage quite well at performing several tasks. As a simple test, I set my HP Vectra AT compatible to work downloading a large file from The Source using ProComm, then set it printing an equally large file from WordStar and finally opened up another copy of WordStar and bashed away at the keys as fast as I

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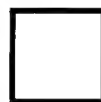
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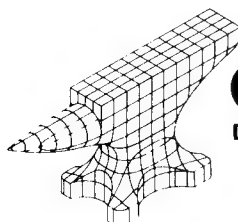
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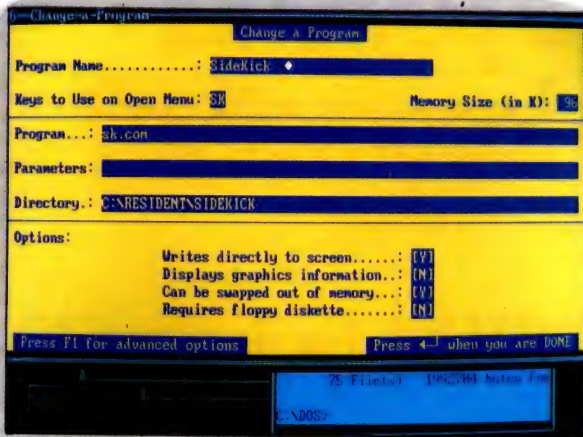
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SCREENTEST



Setting up a program to run under DESQview is a critical operation. Although there are only a few choices to make, the answers much be right for the program to work properly with DESQview

paste information to and from any window on the screen. As well as simple cut and paste, these operations can be buffered so that different sections from within one application or several applications can be run together. DESQview also provides a wide range of options for pasting information back in so that it will remain aligned in the same way as it was in the original window from which it was taken.

Features

DESQview 2.0 is considerably changed from the previous version DESQview 1.3. This allowed multi-tasking and windowing of up to ten programs at a time as long as they were well-behaved and were text mode only. DESQview 2.0 allows multi-tasking and windowing of up to 250 programs at once and these may include graphics programs as well. Support for the 80386 processor has been added and, in addition, DESQview 2.0 works properly with the new IBM PS/2 range. Many programs are now claiming PS/2 compatibility because they are shipped in 3.5inch disk versions as well as 5 $\frac{1}{4}$ inch. However, DESQview 2.0 and Turbo Basic are the only two programs I know of that support the VGA graphics modes of the PS/2.

In addition, the range of 'badly-behaved' programs that DESQview can work with (such as GEM or Windows) has been enlarged. It does this by providing a special loader for them that lets it control them rather than be controlled by them. Unfortunately, the list of applications supported in this way is still too small. Many of my favourites were not on the list, although a large number of standard business programs such as Lotus 1-2-3, were.

Graphics programs can also be run, but unless you are using an 80386 machine with Quarterdeck Extended Memory Manager 386 (QEMM386), then they will need to be run as full-screen applications. The graphics screen can be put in a window, but the application will be frozen. With QEMM386 and an 80386 processor, however, you can have as many CGA graphics mode screens in windows as you like, all still running. Also, using enhanced expanded memory (EEMS) rather than other forms of extended or expanded memory is an advantage. EEMS is a proper virtual memory system and allows programs residing within the expanded memory to be actually running, so you can have several megabytes of programs all running at once.



DESQview has a few applications available immediately before any new ones are installed. Shown here are the memory display (being resized), a DOS window and the rearranged sub-menu of DESQview



This screenshot shows the disk manager program, DOS Services, that comes with DESQview. It is a fully-fledged disk manager similar in function to products like X-Tree. It can call up DESQview menus or run its own multi-tasking sub-programs

could — no attempt to write properly, just enter letters as fast as possible. Even at about 200wpm typing speed, I could detect no slowdown in the word processor and both the file

download and printout performed beautifully.

Since DESQview controls the programs and windows running under it, it is also possible to use it to cut and

SCREENTEST

DESQview 2.0 also comes with a built-in DOS 'Services' manager. This lets you get directories and mark, copy, delete and move files around. Besides this, you can also open a DOS window at any time with 128k of memory available. This can be used for simple DOS functions or running short, simple and well-behaved programs.

One other major facility of the program is its ability to learn 'scripts'. These let the user assign any sequence of operations in DESQview or in any set of programs running under DESQview to a single key. For example, you could set DESQview up so that it automatically started your word processor and loaded in (or even typed from scratch) a business letter template, then paused while you entered in a name and, finally, continued by filling in all the greeting part of the letter at the start, leaving you to type in the main paragraphs in the middle to produce a complete business letter with no fuss. Or DESQview could be used to open up your monthly accounts on the spreadsheet, mark the relevant figures for a regular report and paste them into a word processor document ready for you to add some final notes to complete the report.

Many of the ordinary operating parts of DESQview 2.0 have been considerably improved since DESQview 1.3. A particular example is that communications tasks have been optimised. If you are using a communications program under DESQview 2.0 — even as a background task — it runs as smoothly as if it were the only program running on the machine. The only noticeable change is that large chunks of text appear to come in bursts rather than steadily from the communications program.

Another nice touch is that any window on the screen can be scrolled — as if the window were looking through a frame onto a full-sized screen underneath. Also DESQview automatically scrolls the window when anything is printed in it so that the printed information appears in the visible part of the window.

Finally, DESQview comes set up in such a way that a programmer can easily write his own applications to make full use of DESQview windows, menus, sub-tasks and message-passing between tasks. Some of these functions are only available to programs specially written for DESQview; hooking your own programs into DESQview in this way can help you to produce extremely powerful and useful multi-tasking

programs. For example, DESQview specific applications can perform proper inter-task communication, so that a DESQview communications program could be set to send parts of any received information to a DESQview word processor automatically; or a program could be downloaded from a remote database and automatically installed and run under DESQview.

In use

DESQview may all sound a bit too good to be true, but it is true except for some details: there are problems with the amount of available memory for extremely large programs, and it may not be possible to run more than one copy of some programs with I/O problems. Also, there are a few programs which when run require the operator's attention continuously and, if paused, might as well be removed from the machine. (Games programs are a good example of this.) Once these limitations are understood, it's easy to tell what will and what won't work well.

Installation of DESQview is critical to its correct operation, so Quarterdeck has made the set-up program simple and easy to use and, more importantly, it can be rapidly re-installed at any time. To install the program, simply run the set-up program and follow the instructions. You are given the option to perform a simple or advanced set-up. The simple set-up is enough to get you going and get used to the program, after which you will need to run the advanced version.

As soon as DESQview has been installed, you will need to install different applications under it; this is a more complicated process. Many applications are listed on the install menu and, with these, installation is merely a matter of telling DESQview where to look for the applications program. Any programs not on the list must be manually installed and this can be a difficult business. The hardest part is allocating the amount of memory a program will need. Too little and it won't work; too much and you will waste space that could be occupied by another application. For those applications for which I did not know the amount of memory needed, I found it best to start with too little and kept testing and allocating more memory until the program worked properly. (It is very important to experiment properly since if an application does run out of memory under DESQview, it will try to grab more and it is sometimes not possible for DESQview to prevent this.

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DESQview can be installed for use with either a mouse or the keyboard. The keyboard tends to be quicker, but the mouse feels better in use since it can be used, Mac-like, to size, scroll and move windows on the screen. It is probably a good idea to try both and see which you find more useful. It is important to realise that if DESQview is installed for the mouse, it may well not work properly in your application program. If you set DESQview to use the keyboard, however, then the mouse will work properly in the application.

Using DESQview is a little odd. It is exactly the opposite of using a memory-resident pop-up program. Memory-resident programs pop up over any current application and disappear when no longer needed. DESQview pops the application up and is always there lurking in the background, monitoring. All your ordinary applications become pop-up and memory-resident; available at the touch of a key and shoved away in windows. Only the one you are currently working on seems to be active, even though other tasks may be running quietly in another window. It is a very strange environment to work in and I am still accustoming myself to it.

In DESQview it is also very easy to zoom an application up to full window size and forget about other open applications. If you then quit DESQview, you will have lost work in other windows. Fortunately, DESQview can be set up so that it won't close unless all the windows have been shut down separately.

One thing that is hard to do is to 'get lost'. The whole program is controlled by menus accessed either entirely with the mouse or using the 'CTRL', 'ALT', 'SHIFT' and 'cursor' keys. Short-cuts using initial letters from the pop-up menus are available but you don't have to use them. I found this side of the program extremely easy to use, and a sheer delight.

DESQview makes use of EGA and even VGA modes properly and I was able to get displays of up to 43 lines using EGA. This meant that I could have one 80x25 application and one 80x14 application at once, which could be very useful. However, graphics didn't seem to work so well. Although the program worked with graphics, it would only do them full-screen. If the application is frozen, then the graphics screen could be put in a window, but not while it was working. The manual says that CGA screens can be freely put in windows on 386 machines while continuing

to work, but I was unable to try this.

The application I found DESQview most useful for was transferring information and files via various online services in the background while continuing to work on editing a document in the word processor or outline processor in the foreground. This operation worked perfectly the first time I tried it; it was also useful for continuing to work while sorting my phone list in the database. The only thing to watch out for is clearly indicated in the manual: communications programs must be run only when held in the computer's normal memory.

The other main use I found for DESQview, and the one that would make me seriously consider buying it, was keeping several applications open at once and ready to use. This may sound a little unnecessary, but I found it very convenient to have my communications program, word processor, phone list, disk manager and a programming language all available at the touch of a key.

Problems

There were, however, a few problems, but most of them were of my own making when I tried to do ridiculous things in order to push DESQview to its limit. The worst problem was with printer conflict. I tried to get three different versions of WordStar to print different files at the same time on the one printer. I set DESQview up to manage printer conflicts and let the three programs start. DESQview seemed to manage okay, but when I came to look at the output it had only partly succeeded. All three printouts were printed in large contiguous chunks, but DESQview had decided to switch between the applications halfway down a page. This meant that I got five and a half pages of one document, then five and a half of another, and so on. Unfortunately, half-pages aren't very useful. Printing one document while doing other non-printer tasks worked fine, so I recommend not doing anything silly like trying to do lots of printing with DESQview all at once.

Subsequently I discovered that installing DESQview to manage printer conflict caused problems even when printing a single WordStar file. This is to do with WordStar's inability to properly manage sending all the information to the printer. WordStar pauses once the printer buffer has been filled and has to manually be told to restart. When WordStar pauses, DESQview does something to manage task-switching that messes up the printer.

By resolving printer conflicts, DESQview ensures that only one application can print on any one page, but because of the PC's hardware idiosyncrasies it is unable to tell when an application has reached the bottom of a page. This means that if an application such as WordStar pauses halfway down a page, DESQview detects the pause and switches to a new application — which starts on a new page. Of course, everything will work fine if the application that is printing only pauses at the end of pages.

Another problem I deliberately created with WordStar was to have four different versions of WordStar editing the same file. Not surprisingly, WordStar got very confused (but not DESQview). It occurred to me that programs which can do file-locking for network access would probably not mind this, but I hadn't set my WordStar to do this and every single one of them refused to save the file. On quitting I discovered I had lost it — fortunately, I used a test file rather than something I needed.

One area in which I expected to encounter problems was in using large numbers of applications; I didn't have any. I got up to forty programs open at once before I got bored, but none of them had any problem running. However, swapping applications in and out of memory took a while. Expanded memory in the form of a Quadram Quadboard-AT helped, but forty applications easily fills up expanded memory too.

Although DESQview works fine on floppy-based systems, problems can arise if you use too many applications since swapping memory out to disk takes much longer. However, using only two applications at the same time worked well.

Conclusion

If all you want is to run several of your current MS-DOS applications at once, then DESQview is a convenient and cheap solution. Remember, though, that DESQview works better on hard-disk systems and even better with extended or expanded memory. Also, watch out for those problems with allocating memory and printer clashes!

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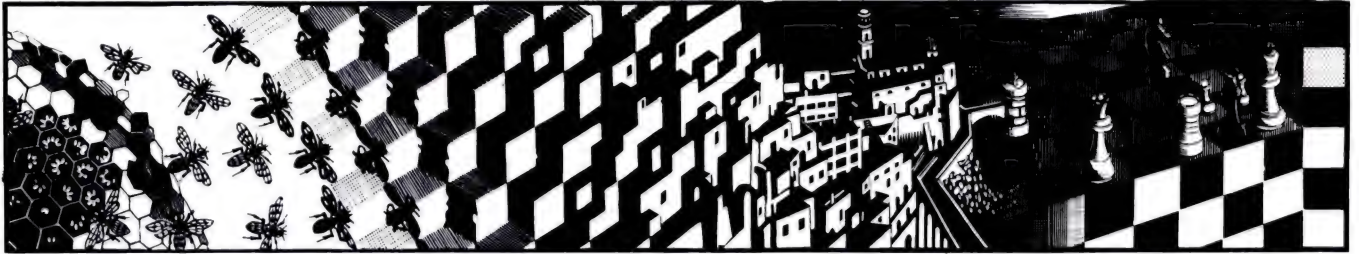
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B 431



In a brave attempt at self improvement, Stephen Applebaum joins the ranks of snivelling thieves and tries to recapture his youth. No luck there, though, as he reviews the best of this month's games releases.

How have the mighty fallen

Title: Guild Of Thieves

Computer: ST; Amiga; Commodore 64/128; Apple

Supplier: ISD

Price: \$79.99 (ST, Amiga); \$59.99 (Commodore 64/128); \$69.99 (Apple)

The Guild Of Thieves, Magnetic Scrolls' long-awaited follow-up to The Pawn, has arrived at last. Full of wit, accomplished artistry and a plethora of puzzles, this new graphical adventure looks set to emulate, perhaps even surpass, the success of its forerunner.

Once again the action takes place in the mythical world of Kerovnia; a land where anything and everything can, and usually does, happen. The place has changed so much for the worse since the halcyon days of The Pawn, that veterans of that first adventure will hardly recognise it.

What is more, it is not only Kerovnia that has gone steadily downhill but your character, too. No longer are you the magnanimous knight in shining armour but a snivelling little thief, and an apprentice one at that.

Yes, times are hard. Not even your past exploits are suitably impressive credentials to gain you honorary membership of the Guild Of Thieves. Only by passing the guild's assiduously monitored initiation test can you hope to gain entry to its corrupt ranks.

Unlike The Pawn, which has a very nebulous scenario, The Guild Of Thieves is much more defined in terms of what is expected of you.

You know, right from the start, that you are supposed to gather numerous treasures from various locations in Kerovnia. What you have to discover is the most efficient — not to mention the safest — way of obtaining them.

The game begins with you and the Guildmaster sitting in a small wherry,



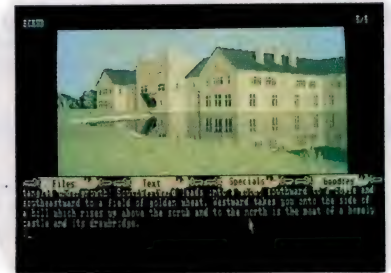
moored alongside a rickety jetty. Handing you a swag bag containing a lamp, the Guildmaster warns you that he and other Guild members will be watching you throughout your novitiate.

Leaving the Guildmaster, you come across a frail old man dragging a large, heavy-looking trunk. Offering the old man your services, you are led to a vast mansion, one of the adventure's likeliest sources of expensive booty.

Wandering through the mansion's many rooms and corridors not only rewards you with a number of important clues, but also provides a treat for the eyes in the form of several, very detailed graphic displays. In keeping with the high standard set by The Pawn, The Guild Of Thieves features graphics of a quality that would make programmers of lesser games weep.

Just as in The Pawn, the graphics occupy the top three quarters of the display, and can be pulled up and down the screen with the mouse like a roller blind.

Amazing as the detail in many of the pictures is, it does not always follow that because something is depicted graphically, it is actually present in the location. This discrepancy between the text and the graphics can sometimes be offputting. But if you remember to rely solely on the text for location descriptions, you will save yourself a



lot of typing and be able to enjoy the pictures for what they are: a pretty device to create the atmosphere lacking from the adventure's often drab text.

Movement, and interaction with your surroundings, is made all the easier by a powerful parser which enables the program to understand statements containing more than one action. Another more useful feature allows you to return to a location already visited, just by entering its name. Unless there are any major obstacles between you and your desired destination, the computer moves you directly to it.

The depths you must plumb in order to join the Guild Of Thieves stretch far beyond the bounds of good taste. Apart from simply robbing the mansion, you also have to rob a grave, steal money from a funeral parlour and prise a casket from the bony grip of a skeleton. I am sure there are worse things, though I have still to find them.

The Guild Of Thieves' greatest strength is its accessibility. Everyone, no matter what their adventuring experience, will be able to reach the game's most extreme locations with very little difficulty. Being able to cope with what you find when you get there, on the other hand, is a different matter altogether.

If you don't like puzzles you are unlikely to enjoy The Guild Of Thieves, as it's full of them. An apparently un-

climbable slippery rope; an ice snake which threatens to strangle you unless you act quickly; a screeching macaw; and a multi-coloured floor that can only be traversed in a certain way, are just some of the many conundrums you have to grasp and solve.

With regard to the macaw, it is strange that both *The Guild Of Thieves* and *Bureaucracy* should contain such a character. Or perhaps it isn't. According to reports, Infocom allowed *Magnetic Scrolls'* Anita Sinclair to play

Bureaucracy while it was under development in the US. Who, I wonder, thought of the macaw first?

In fact, both *Magnetic Scrolls* and *Rainbird* seem to have learned a lot from Infocom, especially where packaging is concerned. Not only do you get a game disk, but also a copy of *What Burglar?* magazine complete with spelling mistakes and ciphered clues, a sealed parchment, a dice with the number three missing, and a plastic credit card courtesy of the Bank of Kerovnia.

The Guild Of Thieves is an excellent

package all round. Easier in some respects than *The Pawn*, it does not exclude relatively inexperienced adventurers by being overly complex. Graphically outstanding, it puts most other ST programs in the shade. However, as I have mentioned, the graphics have been included at the expense of the text. I am not saying there should be less pictures, but that more time should have been spent on making the text more atmospheric rather than leaving it to the artist to make up for the author's lack of detail.

The key to break the spell

Title: *Golden Path*
Computer: Atari ST
Supplier: ISD
Price: \$79.99

Golden Path at first sight seems just like a simple arcade adventure, but gradually unfurls into an amusing odyssey that traces your development from benighted monk to enlightened spirit.

In the game you take the part of Y'in Hsi, a young man whose youthful impetuosity has made him the unwitting victim of an ancient spell. Donning a ring bequeathed to him by his late father, Y'in Hsi released a strong magic which sapped him of his youth and turned him into the enfeebled form of his father as an old man.

For Y'in Hsi to shake off his progenitor's withered body, he must tread the *Golden Path* to wisdom; knowledge and insight being the key that will break the spell.

Although *Golden Path* is a graphic adventure, it relies heavily on arcade-style action rather than the text/graphics combination of *The Guild Of Thieves*. However, this does not mean you simply switch off your brain and leave everything to your reflexes: *Golden Path* is actually like a massive jigsaw puzzle whose pieces are obtained by passing aptitude tests of increasing degrees of difficulty.

The game's display consists of a number of boxes and icons. At the top of the screen is the playing area, a large window containing the current scene or location and the characters present there. Below is an animated book called the *Book of Knowledge*; alongside this are four small compartments representing pockets of your character's clothes; and finally, at the bottom right of the display, is a small representation of the playing area, indicating the direction or directions the *Golden Path* takes as it trails off the screen.



Squeezed between the playing area and the boxes underneath is a crawling vine that blooms and withers depending on Y'in Hsi's current state of health. When something is eaten or a puzzle is solved, tiny flowers open along the vine's length. During periods of inactivity, the flowers become discoloured.

Y'in Hsi is depicted as a large, animated figure who totters around the playing area under your control. Despite his age, he can still punch like a young man, and even kick when necessary; two actions which come in handy for dealing with some of the more unsavoury characters who live along the *Golden Path*.

In the ST version, Y'in Hsi is controlled by moving a pointer consisting of a Chinese character to either his left or right side, and then holding down the left mouse button. While the mouse button is depressed, Y'in Hsi walks towards wherever the cursor is pointed. If you press the right button instead of the left, Y'in Hsi throws whatever he is holding in his hands.

He can also be made to pick up or drop an object by placing the cursor over a part of his body and then pressing the left button. Although Y'in Hsi can only hold one article in his hand at a time, he can store four others in his pocket, no matter what the size of the objects.

I have briefly mentioned the *Book of Knowledge*. Each time you enter a new location, the book turns to a new page

which can be read by clicking on the book icon at the bottom of the screen. The graphic display is then replaced with a written description of your current location, including a list of the objects lying there.

Another book that comes in useful is the *Book of Law*. This appears at different intervals in the game, and can be read for the clues it contains. When the *Book of Law* has been opened, it disintegrates, only to reappear in another location with a new clue.

Though not nearly as sophisticated as those in *The Guild Of Thieves*, *Golden Path's* graphics are still a delight — and a lot better than in most other arcade adventures. Ones which I found particularly good, and which came as a pleasant surprise when I first played the game, are a detailed underground cavern bedecked with flaming torches, and a raging waterfall.

Apart from graphics, *Golden Path* contains some of the best digitised sounds I have heard on any micro other than the Amiga. For example, there is a lion that actually roars; a female demon who cackles; a dog that barks; a goat that bleats; and an imprisoned boy who cries 'Help me'.

Golden Path is a piece of light relief compared to the likes of *The Guild Of Thieves*. Because it is so easy to get into, it is highly enjoyable, and I find myself returning to it time and time again.

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Importance of style

It is every programmer's dream to write clear, well-designed programs but good programming style takes practice. In this article Mark Burgess explains the significance of 'structured' programming with a working example to guide you through.

It is a sad but certain fact that the general standard of programming today, both in popular press and in the industry, is diabolical and that the quality of its presentation is even worse.

The underlying problem has its roots in the way in which computing is taught. It is only too common to read articles extolling the virtues of structured programming; it is less common to read an article explaining precisely what this means! This article is intended to remedy this oversight, by explaining the significance of structure and then by offering some simple guidelines for developing and presenting program text.

Two totally independent skills are involved in computer programming. These are:

- (1) solving problems (of structuring); and
- (2) writing down problem solutions in a particular programming language.

The more difficult of the two is the former.

Structure

Structure is a very simple and elegant idea, but one which has far-reaching implications. Its real importance derives from the fact that it is a major simplifying tool for solving problems and hence writing programs. Problems are most clearly understood when they can be viewed as a list of things to be done, and structuring is a way of ordering the individual tasks to be performed in a coherent way. The ordering of tasks is what distinguishes a program from gibberish and it is, therefore, something which must be ad-

dressed seriously in programming. It is almost impossible to save a difficult problem without first planning a strategy.

Consider the simplest possible structure: a *numbered list*. No-one would consider writing out such a list of things to do in a random order. It would be absurd to do so and would obscure the object of the list. Computer programs *are* just lists, however, although slightly more complicated than simple numbered lists, but in almost every published instance their procedures are ordered in a quite random way, making a mockery of very fundamental program logic.

Consider the structure of a computer program, then. Just as a simple list can be written out in point form (1..10), a computer program can always be drawn as what one might call a *structure diagram*: this is a generalisation of the list, with a very simple form, and it imitates the very operation of the computer program. Structure diagrams are excellent tools both for helping to design programs and for keeping them sound and logical, and thus they are described in some detail in this article.

A computer program naturally generates many patterns; the simplest and most important ones are considered here. By recognising and welcoming these patterns, programming can be made almost trivial, even in the most insidious cases. It is possible to distinguish, for instance, between large-scale and small-scale patterns and structures: a program which is very logical in small areas may in fact be a complete mess when taken as a whole (a randomly ordered list of clear tasks). It is not good enough that programs

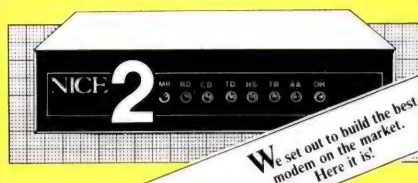
merely be made up of more than one procedure or function: this in itself is not structuring. The procedures and functions of a program must themselves be logically ordered so that a program has a true logical structure which reflects exactly what it does.

What then are the simple patterns which make programming so easy? They are called *hierarchies* and *trees* in the jargon and they permeate programs in an extreme way. Two other words which appear in connection with the two above are *nesting* and *levels*; these will become more apparent as things proceed. Loops, for example, are said to be nested when one loop is executed inside another loop, which is executed inside another loop, and so on, a given number of times. The idea of a hierarchy can be understood with the help of the following analogy:

Consider an artist who is making a drawing of an object which lies under his/her microscope. The artist has the power to zoom in and out by altering the magnification of the microscope and can, therefore, examine as large or as small an area as is necessary. To begin with he/she uses the lowest possible magnification in order to sketch the general shape (or structure) of the object. Next he/she proceeds by zooming in on a small part of the object and fills in the general details. This is repeated until the original general shape is filled with general detail. Having done this, the artist goes back and adds the very finest details at the highest magnification and keeps on doing this until the picture is finished.

The connection with programming is straightforward. Each part of the draw-

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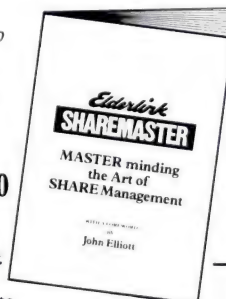
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ing process is actually a procedure to be carried out. The magnification relates to the *level* at which the artist is working (hence the terminology) and so the structure diagram for the drawing process also splits up into levels. Low magnification is called *high level* because one looks down on the object as a whole; high magnification is called *low level* because it is down among all the detailed working parts. The value of the structure diagram shown here is that it shows how the low-level parts of the drawing (the details) are related to the high-level parts, hence showing the overall scheme of the program in as much or as little detail as is desired. In this respect, structure diagrams are far superior to old-fashioned flow diagrams, which are actually steps in the wrong direction, encouraging the programmer to think at the low level first.

This approach to problem-solving is called 'Top Down analysis' for obvious reasons. Its significance is that it reflects the way that we think most efficiently. We see outlines first and fill in details afterwards, rarely the other way around.

Each procedure in a program (or its structure diagram) branches out into other procedures which lie in the level below. The procedures in a particular level actually serve the root procedures in the higher level which use them, like the slaves of the Roman households. A structure diagram manifestly displays the chain of command and neatly pieces together a task as the sum of its parts. It is quite possible to follow exactly what the artist (or computer) does merely by tracing the diagram.

To summarise the form of structure diagrams (and, therefore, the form of well-structured programs): a structure diagram consists of one main procedure at 'LEVEL 0', which branches out into a new LEVEL called 'LEVEL 1' and contains all those procedures which are contained by (used in) LEVEL 0. All the procedures used in LEVEL 2 are found in LEVEL 1, and so on, until there are no more procedures left. (There are no procedures left when a particular task can be easily performed, using only the functions offered by the programming language.) While it is obviously not possible for programs written in a language, using a normal screen editor, to look exactly like their structure diagrams, they can retain the essential features (see the example program). The structure diagram can be squashed sideways so that the levels are preserved and the tasks or procedures are listed, one

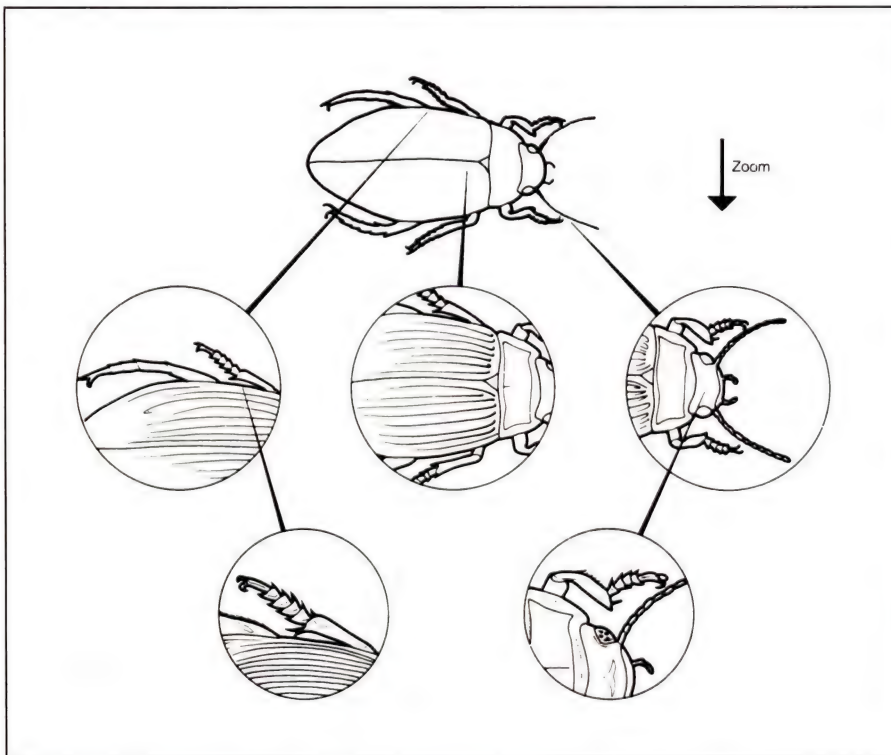
PROGRAMMING

after the other, inside their respective levels. This shows, at least, the status of every procedure in the hierarchy and means that procedures can be found very easily: any procedure which is called in LEVEL 1 would be found in LEVEL 2 and, conversely, any procedure defined in LEVEL 2 would only have been called in LEVEL 1.

The above scheme is not quite complete, it turns out, and must be appended slightly in order to work faithfully in all instances. The question natural-

Programs constructed in this way are highly portable, since it is only necessary to replace a particular toolkit in order to carry a program over to a new machine.

A corollary to the toolkit is the 'zone', for very awkward programs — see the example program for details. Zones are important when programming in complex operating environments, such as WIMP environments. They can be regarded as logically independent parts of a program: places for interfacing to



Each level of magnification reveals new complexity

ly arises as to what happens to procedures which are used throughout all the levels, such as special printing routines or graphics routines to draw certain shapes: some logical scheme has to be found for these.

The key to this lies in the reusability of such procedures. With a little consideration it can be seen that they are routines of a very general nature, which behave as basic tools for the main procedures. This motivates their inclusion in a special level, or set of levels called 'toolkits'. A good reason for doing this is that toolkit routines are a type of routine which come to be needed again and again, in many different programs perhaps, and can subsequently be isolated and re-used. Toolkits automatically result in routine libraries, some of which hold details relating to particular computers only.

an operating system, for instance. They could also be an alternative to the use of object languages.

The writing of a computer program is identical to the construction of a structure diagram. Indeed, a program is just a structure diagram which has been written down in a programming language, rather than as an annotated picture.

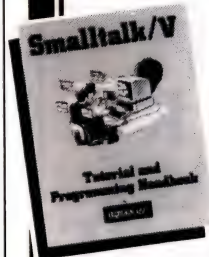
This, in fact, is the crucial point. It means that, by understanding structure diagrams, programs can be written without the need for a particular language: they can be written by simply drawing a picture. A structure diagram is nothing to do with language and can be written down in any language at all (provided it has a sufficient vocabulary); each language is as good as the next and learning new ones is a trivial matter of looking up equivalent words in the manuals.



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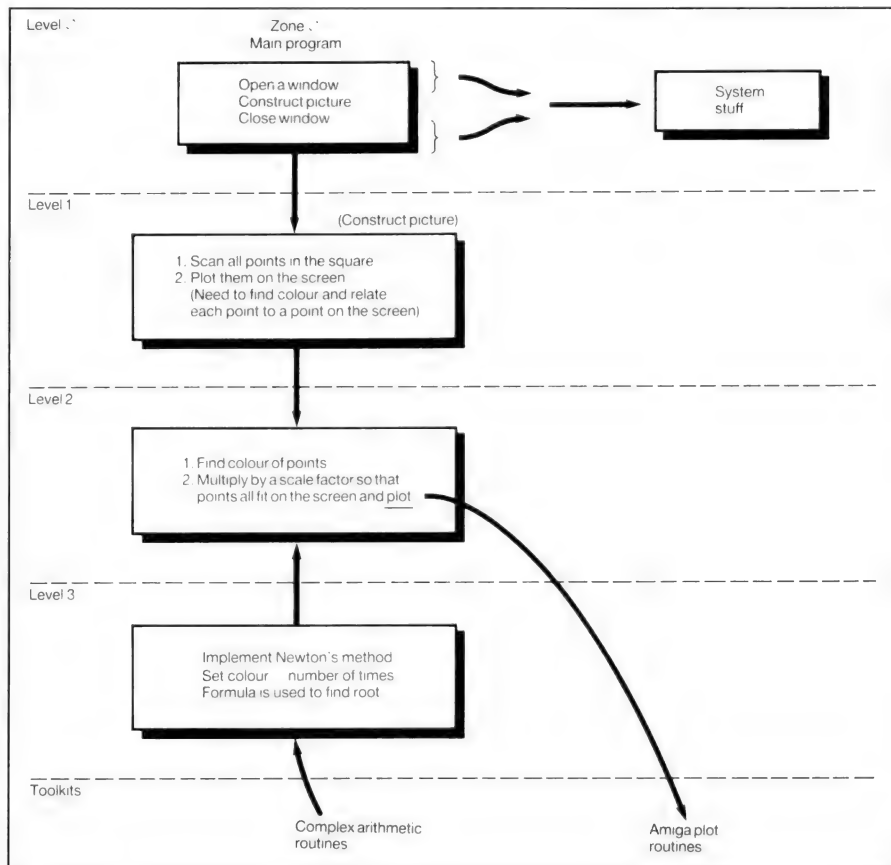
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Presentation

So far only tidiness and clarity have been discussed. Another crucial facet of programming is *presentation*. Programming languages are as much for communicating ideas to people as they are for communicating ideas to computers. In the next section, some rules are described which can be illustrated with the help of an example program (see the program listing). The chosen program is a graphics demonstration (to be written in C, for the Commodore Amiga) and will be developed with the aid of the guidelines given. You should try to convert it to run on other computers — and in other languages.

Guidelines for presenting programs

These guidelines essentially say: be neat and take a pride in programming; be consistent and write clearly! The examples given are for Algol-like languages (Pascal, Algol, Modula2 . . .) and C, but they are simple to implement in Basic, BCPL . . . in fact, any

language at all which allows comment to be included in a program file.

The first step is always: **solve the program problem with the help of a structure diagram** and some sound planning.

LAYOUT & USE OF SPACE

All procedures and functions must be written down in their correct levels (as described in the main text). A procedure should never be longer than a page of A4 (that is, about 70 lines) and should rarely need to be that long. Both the levels and the procedures themselves should be clearly segregated, with a banner heading each level/toolkit. An area should be reserved on the right-hand side of the page (or screen) for comments and notes (see more under Comments). Each new program statement should be on a new line. Don't make programs nebulous by hiding statements in among comments.

NAMES AND IDENTIFIERS

The names of procedures should clearly reflect their functions. The names of variables should clearly reflect their usage. *Never* choose names without good reason. *Never* use GOSUB if

PROGRAMMING

PROC or a procedure will do instead.

Take advantage of actual/formal parameters (permitted in all good language implementations) to make the labelling of variables consistent and sensible: that is, when variables are passed as arguments to several different procedures, make sure that a consistent name is given to particular quantities, throughout the whole program. In other words: try not to confuse the reader.

Examples

(a) If a procedure works out the total of a list of figures, call it something like FIND TOTAL or TOTAL or FIND TOT or something short and descriptive.

(b) If a variable stands for the total value of something, call it TOTAL, not X.

COMMENTS & DOCUMENTATION

Each procedure should have at least one brief comment describing its function. Any further comments should also be brief. Do not lecture: this obscures the program code. Procedures ought to be self-explanatory anyway if the names of variables and procedures have been chosen judiciously. Further comments should be written in the documentation to the program. Documentation must include a specification of the program: it must describe exactly what the program does and does not do and should contain notes of any known instances when the program will fail to work sensibly, either bugs or limits of the program specification.

Example

```
find_total (array : a);  
begin
```

```
... {Comments should be separate  
from program code}  
end;
```

LOOPS AND NESTED LOOPS

Loops and their surrounding brackets should be indented and should be clearly visible. Always put a block bracket (that is {, }, begin, end ...) on a line of its own. For example,

```
for n:= 1 to 10 do  
  begin  
    writeln ('...');  
  end
```

When loops are *nested* (that is, when there are loops inside other loops), indent for every loop and make the *level of nesting* clear.

```
Write:  
for ( n=1; n <= 10; n++)  
{  
  while (a < b)
```

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```
{
    printf ("...");
    printf ("...");
}
printf ("...");
}
```

in preference to

```
for (n = 1; n <= 10; n++)
{ while (a < b) {
    printf ("...");
    printf ("..."; } }
```

GOTO

It is never *necessary* to use GOTO. If the need ever *seems* to arise, it is a sign that the program is either poorly constructed or inappropriate for the given language.

FINAL POINT ABOUT BLOCK BRACKETS

Block brackets (like begin, end and C's { and }) are essential punctuation in a program. It is best to adopt a consistent practice in their use so that a program looks the same all over. This means that every time such brackets are used, the same structure should be adopted: for example, write:

```
complex = record
    real : x, y;
end;
in preference to:
complex = record real : x,y; end;
```

Perhaps the clearest use of brackets is the method which has been adopted here.

SPECIAL NOTE FOR USERS OF PASCAL/ALGOL...

In Algol-based languages, a program-

mer is required to define every variable, procedure and function before it is used.

This makes the appearance of the final program slightly odd: the main program lies at the end of the text and the toolkits are all found at the top. In other words, the structure diagram in Pascal/Algol is upside down. This doesn't really matter: the rules still apply — and in fact they reveal their usefulness in a very obvious way. If the levelled structure is adhered to strictly, then the requirement that everything be defined before it is used, is automatically satisfied.

The example program

(1) The problem

The example program is deliberately complicated, to illustrate as many of the ideas as possible. It follows a theme which has been explored recently in many of the popular computer magazines and lends itself neatly to the illustration. The objective is to plot out a diagram in the complex number plane. (For the benefit of non-mathematicians, this is just a flat square, with coordinates traditionally called (z) where z is actually made up of two parts, labelled by x and y like: (z.x,z.y) — instead of the more usual (x,y) coordinates. They are, in effect, the same.) The diagram is based upon finding the cube roots of 1, which are complex numbers.

For every point in the square region from bottom left (X0, Y0) to top right (X0+range, Y0+range), the program will use Newton's method of finding the cube root, starting with that point as a first guess. Newton's formula for obtaining a better approximation (z) to the

cube root of 1, starting with a random guess (zp) is:

$$z = 2 \cdot z^3 + 1 \\ 3 \cdot z^2$$

where $z^3 = z^p$ cubed and $z^2 = z^p$ squared. The rule for multiplying the z^p 's is part of complex-number theory and must be defined in the program. Since z and z^p are complex numbers, they have two parts, and this is subsequently two formulae:

$$z^p \cdot x = 2 \cdot z^3 \cdot x + 1 \\ 3 \cdot z^2 \cdot x$$

and

$$z^p \cdot y = 2 \cdot z^3 \cdot y \\ 3 \cdot z^2 \cdot y$$

The program must obtain quite a good estimate of the cube roots, and so it should reapply Newton's formula to z in order to obtain a new z, and keep doing this until z doesn't change very much (the formula has reached the actual value of the root and can't get more accurate). The diagram will be made up of points of colours (1... numofcolours) which show how many times the process had to be repeated in order to get close to the answer. (The resulting pattern is pretty, if not interesting).

(2) The solution/structure diagram

To implement this process, a structure diagram is drawn. It is worth remarking that one purely practical thing which must be done in a graphics program is to make a window or define a screen mode in which graphics can be drawn. This is nothing at all to do with the main problem so it ought to be kept apart from the main core of the program.

Example program to plot a diagram in the complex number plane

```

/* ***** */
/* 3 */
/* Roots of Z + 1 == 0 */
/* (M.Burgess 1986 / Lattice C for Commodore AMIGA) */
/* ***** */

/* Program plots a rectangle in the complex plane, starting at */
/* (X0,Y0) and ending at (X0+range,Y0+range). Colours are given */
/* to each pixel to indicate the number of iterations of Newton */
/* Raphson method required to reach the cube roots +/- a const. */
/* called "toobig" with (z) as a starting estimate */

/* ***** */
/* Include some library files for linking */
/* ***** */

#include "stdio.h"
#include "math.h"
#include "limits.h"
#include "zonen.c"

/* ***** */
/* Manifest Constants / Macros */
/* ***** */

#define range 4.0 /* square box centred on 0,0 */
#define toobig 0.01
#define X0 -2.0
#define Y0 -2.0

#define numofpixels 100.0 /* choose resolution */
#define numofcolours 16 /* maximum no of colours */

#define screensize 160.0 /* max resolution */
#define divbyzero 0 /* for readability */
#define pixsize screensize/numofpixels /* size of one pixel */

/* ***** */
/* Structures */
/* ***** */

typedef struct /* Define a datatype called complex */
{
    long float x,y;
}
complex;

/* ***** */
/* LEVEL 0 : Main Program */
/* ***** */

main ()
{
    open_graphics_window ();
    create_picture ();
    wait_for_window_close ();
}

/* ***** */
/* LEVEL 1 */
/* ***** */
```



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```

create_picture () /* generate complex diagram */
{ long float increment, scale;
  complex z;

  increment = range/numofpixels;
  scale = screensize/range;

  for (z.x = X0; z.x <= X0+range; z.x += increment)
    for (z.y = Y0; z.y <= Y0+range; z.y += increment)
      PlotArgandPoint (z, scale);
}

/******
** LEVEL 2
***/
PlotArgandPoint (z, scale) /* Adjust complex numbers to x,y coords
                           choosing appropriate scale */
{
  complex z;
  long float scale;

  { int colour = 3;

  colour = num_of_repetitions_to_root (z);

  z.x = (z.x-X0)*scale;
  z.y = (z.y-Y0)*scale;

  ActualPlot (z.x, z.y, colour);
}

/******
** LEVEL 3
***/
num_of_repetitions_to_root (zp) /* Find root and count repet'ns */
{
  complex zp;

  { int reptcount = 0;
    complex z, z2, z3, top, bottom;
    complex multiply(), divide();

    if ((sp.x == 0) && (sp.y == 0)) return (divbyzero);

    do {
      reptcount++;
      z = zp;
      z2 = multiply (z, z);
      z3 = multiply (z2, z);
      top.x = 2*(z3.x) + 1;
      top.y = 2*(z3.y);
      bottom.x = 3*(z2.x);
      bottom.y = 3*(z2.y);

      zp = divide (top, bottom);
    } while (fabs(zp.x-z.x) > toobig || fabs(sp.y-z.y) > toobig);

    return (itcount % numofcolours);
  }

}

/******
** TOOLKIT Graphics (AMIGA)
***/
ActualPlot (x,y,colour) /* Plot a point (x,y) on the screen */
{
  long float x,y;
  int colour;

  { struct RastPort *r = wG -> RPort;
    int ix, iy, p;

    SetAPen (r, colour); /* set colour pen */
    ix = (int)(x*0.5); /* round to nearest integers */
    iy = (int)(y*0.5); /*
    p = (int)(pixsize*0.5); /*

    RectFill (r, ix, iy, ix+p, iy+p); /* Plot and fill a rectangle */
  }

}

/******
** TOOLKIT Complex Number Arithmetic
***/
complex multiply (a,b) /* return a times b */
{
  complex a,b;

  { complex z;

  z.x = (a.x * b.x) - (a.y * b.y);
  z.y = (a.y * b.x) + (a.x * b.y);

  return (z);
}

}

/******
** LEVEL 4
***/
complex divide (a,b) /* return a divided by b */
{
  complex a,b;

  { complex z;
    long float denominator;

    denominator = (b.x * b.x + b.y * b.y);
    z.x = (a.x * b.x + a.y * b.y)/denominator;
    z.y = (b.x * a.y - a.x * b.y)/denominator;

    return (z);
  }

}

/* end */

/******
** ZONE 1 : GRAPHICS open a graphics screen & window
** (AMIGA system details)
***/
#include "types.h"
#include "intuition.h"

#define WINDOWGADGETS (WINDOWSIZE|WINDOWDRAG|WINDOWDEPTH|WINDOWCLOSE)
#define true 1

extern struct Window *OpenWindow();
extern struct Screen *OpenScreen();

int IntuitionBase = NULL;
int GfxBase = NULL;
USHORT class;

/******
** STRUCTURE ASSIGNMENTS
***/
struct NewWindow nwGraphics =
{
  20, 20, /* top left x,y */
  480, 160, /* width,height */
  1, 2,
  MOUSEBUTTONS ;
  CLOSEWINDOW,
  WINDOWSIZEING ; RMBTRAP ;
  GIMMEZEROZERO ; WINDOWGADGETS,
  NULL,
  NULL,
  "Graphics Window",
  NULL,
  NULL,
  50, 40, 200, 100,
  CUSTOMSCREEN
};

/* SEE "INTUITION" MANUALS */

struct NewScreen NewScr =
{
  0, 0, /* top left x,y */
  640, 400, 4, /* width,height,type */
  1, 0,
  HIRES,
  CUSTOMSCREEN,
  NULL,
  "Graphic Screen",
  NULL, NULL
};

struct Window *wG;
struct Screen *Scr;

/******
** LEVEL 0
***/
open_graphics_window () /* Opens INTUITION and a gfx window */
{
  GfxBase = OpenLibrary("graphics.library", 0);
  if (GfxBase == NULL)
  {
    printf("graphics library open failed\n");
    exit(0);
  }

  IntuitionBase = OpenLibrary("intuition.library", 0);
  if (IntuitionBase == NULL)
  {
    printf("intuition library open failed\n");
    exit(0);
  }

  Scr = (struct Screen *) OpenScreen (&NewScr);
  if (Scr == NULL)
  {
    printf("Couldn't open new screen\n");
    CloseLibrary(GfxBase);
    CloseLibrary(IntuitionBase);
    exit(0);
  }

  nwGraphics.Screen = Scr; /* Must precede window open */

  wG = OpenWindow(&nwGraphics);
  if (wG == NULL)
  {
    printf("open window failed\n");
    CloseScreen (Scr);
    CloseLibrary(IntuitionBase);
    CloseLibrary(GfxBase);
    exit(0);
  }
}

/******
** LEVEL 1
***/
wait_for_window_close () /* Wait for the user to close window */
{
  struct IntuiMessage *message;

  while (true)
  {
    while ((message=(struct IntuiMessage *)GetMsg(wG->UserPort))==NULL);
    class = message->Class;
    ReplyMsg(message); /* Must reply to messages */
    if (class==CLOSEWINDOW) break;
  }

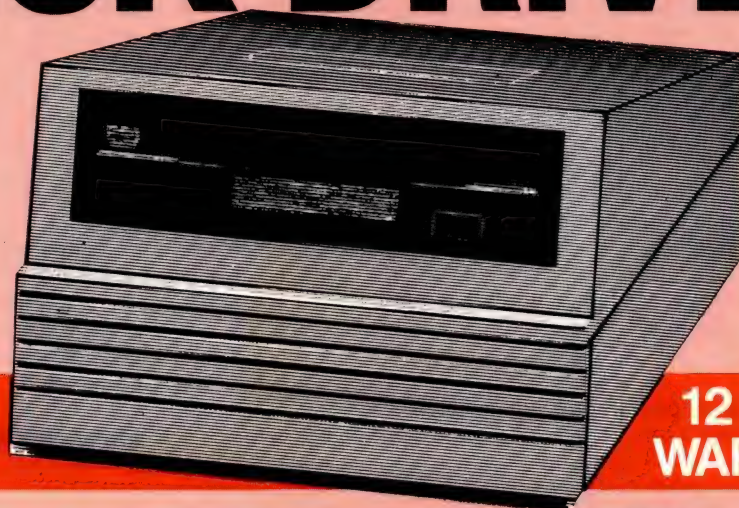
  if (wG != NULL) CloseWindow (wG);
  if (Scr != NULL) CloseScreen (Scr);
  if (GfxBase != NULL) CloseLibrary (GfxBase);
  if (IntuitionBase != NULL) CloseLibrary (IntuitionBase);
}

```

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PROGRAMMING

The scheme above for structuring allows us to use a new zone for this. The simplest way to see the usefulness of doing this is to just look at the listings and observe how this keeps the irrelevant detail out of the way of the main program logic. (Imagine how messy the program would look if it were included in the middle of the main logical structure.)

Try to follow the structure diagram and relate it to the listing. Points to notice in the listing are:

- the rules for multiplying and dividing z's (that is, complex numbers) are defined in a toolkit, so that they can be used again in later programs;
- logically separate parts of the program are separated either by blank lines, separate procedures or different zones; and
- the program contains very few comments, but variable names are clear and relate to what is happening.

Finally, notice how the structure of the program relates to the structure diagram.

(3) Program documentation

Here is part of a summary of each procedure. This is rather shorter than

ideal, for the sake of brevity in this article.

ZONE 0

main () Trivial

create picture () This scans through every point in the square and calls PlotArgandPoint at each point. It passes the point z so that it can be used in Newton's formula. It also passes a parameter called 'scale' which adjusts the values of the complex numbers, so as to fill the screen. To do this it makes use of the 'constants' 'screen-size' and 'range' as defined in the program. These device-dependent (or computer-dependent) constants are defined at the start of the program.

PlotArgandPoint () This accepts a complex number z and the scale factor relating the numbers to the points on the screen. It then calls 'num-of-repetitions-to-root ()' to find out what colour it should plot, and multiplies z so that the points all fill the window size. It then passes the adjusted coordinates to an actual plotting routine for the screen.

num of repetitions to root () This repeats Newton's method of finding the

roots and counts the number of times it must repeat the process in order to get close to the root. The technical details of this are not really relevant to this article, but would be included here otherwise.

The toolkit routines and Zone 1 can also be described, either separately or collectively, depending upon the clarity of their coding.

Conclusion

The example program shows the way in which a program can be structured. The structuring is not only a matter of pride and professionalism but is extremely important in keeping control of programs, especially when they become large and complex. The rules are not only aesthetically pleasing in this respect, but are an important tool for coping with the increasingly complex operating environments which are now being developed.

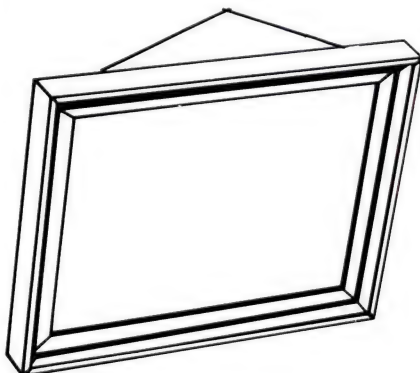
It is to be hoped that something akin to these rules will become a standard of practice and will improve the rather low programming standards which exist now.

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T.M.



TAS – Plus is faster, easier and cheaper. Simply the most advanced database software of the 80's.

TAS – Plus Relational Database gives you everything you need to quickly and easily create your own database applications. It combines the power of a Relational Database and 4th Generation Language with the ease of a built-in Screen Painter and Program Generator. You literally paint the screen and TAS – Plus writes the program for you.

Whether you're a novice or a seasoned pro TAS – Plus is the product that meets your needs no matter your experience or requirements.

Database

- Save up to 65,000 records in one file (limited by disk space and operating system).
- Find any record in a file in less than 3 seconds.
- Number of fields per record is limited only by operating system.
- Up to 254 characters per file.
- Up to 16 files open at same time.
- Up to 16 key fields per field.
- Up to 10,254 characters per record.
- Field type may be alpha, numeric, date or time.
- TAS – Plus Data Dictionary maintains all data file structures in one handy location.
- Dates use only 4 characters of storage.
- Numeric fields stored in BCD format (a 10 digit number uses only 5 characters of storage).
- Numbers can be up to 20 digits long and have up to 8 significant digits to right of decimal place.
- Print reports to screen, printer or disk.
- TAS – Plus program can exchange standard ASCII data with other programs. Convert Dbase III data files to TAS – Plus and vice versa.
- If comparison types include less than, less than or equal to, equals, equal or greater than, greater than, and not equal to.
- Multiple company capabilities allow up to 1,369 different sets of data files to be accessed by the same programs.
- TAS – Plus has 86 commands (plus several options on many commands).
- Supports date and time arithmetic.
- Context sensitive help messages are easily added to applications.
- Find command can search for exact match, partial match, next record, previous record, beginning of file, end of file or related field between two files.

Compiler

- TAS – Plus compiler converts TAS applications into fast running pseudocode (executable by TAS – Plus run-time).
- Automatically checks program for syntax errors and command usage problems as it is compiled. Helps catch "bugs" before they become problems.
- Automatically checks to make sure files exist in data dictionary or are defined in application.
- Compiled run-time programs are automatically compacted so they take up less disk space.
- TAS – Plus allows you to create run-time versions of your applications that are separate from the source code (perfect for program developers who intend on selling finished products).

Screen Painter

- Create screens that will look identical to your applications.
- Easily add color or graphic characters to your screen by making menu choices.
- Automatically create programs by "painting" the screen and allowing TAS – Plus to write the program.

Source Code Editor

- Displays all TAS – Plus commands in plain English.

- No need to memorize difficult syntax. The Editor displays all options and makes sure you make all required entries.

Report Writer

- Create and run reports quickly and easily.
- Columns can be totalled.
- Up to 10 different fields may be used as selection criteria in each report.
- Reports may be run over again and again.
- Report programs can be modified using the source code editor.

Other Utilities

- Browse utility lets you display 10 records at once, choosing which fields and in which order to display them.
- Maintain database lets you add change or delete records in a file.
- Create database adds a new database definition to the TAS – Plus dictionary and allows immediate entry of data.
- All utilities are menu driven and require no programming knowledge.

The Accounting Solution

Now solved is the problem of rigidly fixed off the shelf software. Source Code and the powerful TAS – Plus Developers Database are included – so programs can be easily modified as your needs change. Single and Multi User.

Modifiable Accounting

Includes General Ledger, Accounts Payable, Accounts Receivable and TAS – Plus Developers Version. Source code included.

Advanced Accounting

Includes all in Modifiable Accounting plus Sales Order, Purchase Order, Inventory, and Pay Roll. Source code included.

Developer's Version

For those who need even more power, there's the Developer's Version of TAS – Plus Relational Database. It offers everything that the standard package includes, plus a Programmer's Toolkit. It's the perfect addition for those persons developing sophisticated applications.

The Programmer's Toolbox allows the user to access features not normally available on a database/language. Primary among these are the ability to access additional blocks of program memory (up to 96K), to access files using variable file numbers (even if file names are unknown), and to directly

control the memory stack (pop the stack). You can also have up to 17 million records per file and 32 Indexes per record.

Developer's Version also includes a Trace Utility that lets you place break points in your source code (for easier debugging). The Trace Utility includes: set break points, examine/change field value, and single step execution and Enter other character to continue normal operations.

For those who want to use a standard ASCII editor, the Developer's Version provides a complete cross listing of TAS – Plus commands plus a straight forward method of manually

writing code. This includes a way of incorporating both screens and reports into the actual code.

Developer's Version includes these additional commands:

binary character
close variable file
display memory
file name search
fill memory
find rec var file
memory ptr update
memory space update
move string
open variable file
pop stack
print screen
ready find field
trace enable

TAS – Plus Commands

The TAS-Plus language commands are listed below in alphabetical order:

bell
clear array
clear buffer
clear line
clear screen
close non-tas file
close tas file
compile program
cursor on/off
date
define field
delete record
delete file
display array
else
enter
equals
equals active
records
equals day
equals location
equals month
equals portion of
equals record num
equals size

equals total
records
fill field
find record
for/next
get character
get field from
buffer
gosub
goto
if
if carriage return
if duplicate
if rec not found
initialize file
justify field
line label
menu
mount
on value
open non-tas file
open tas file
print chr5
print black lines
print box
print message
print on
print outside
window
print report line
print set
print vertical tab
put field in buffer
put portion of

read non-tas rec
redisplay screen
reenter field
remark
rename file
return
reindex
file
run dos command
run non-tas
program
run tas
program
save record
save screen
screen lock/unlock
scroll
set color
set file active
set video highlight
set video normal
set video reverse
structure start
structure stop
time
top of form
trap
trim field
uppercase field
while
window
wrap print
write non-tas rec

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Payment: VISA		MC	AMX	Australasian Distributor	
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Actual unretouched photo - 9 pin printer

Many companies have opted for a 9-pin printer because of the cost savings. And regretted the quality of the print ever since.

If you want to make the best possible impression, it makes sense to talk to the people who know most about printers (after all, Toshiba were the inventors of 24-pin technology).

One look at the quality of the Toshiba 24-pin printer print-out will convince you of the improvement over a 9-pin printer. But the really good news is that you can have Toshiba 24-pin quality for around the same price as many 9-pin printers.

You'll have the choice of a range of printers with a selection of font styles and sizes, paper feeds and loading, and a range of prices. In fact, all they have in common is their technological superiority, compatibility with major PC brands, and their legendary Toshiba reliability.

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Doing what DIR doesn't

DR.COM lets you sort files by extension, size, date, time, and DOS order — and view, rename, move, and delete them — without ever typing DIR again. Courtesy of Michael Mefford.

As a file management tool, DOS is a dull knife. When you spot an unfamiliar filename in a DIR listing and stop and TYPE filename to examine it, you lose your place. If the file is okay after all, you have to hit DIR again. If not, it's DEL filename or, to move the file to another directory, you must type COPY filename\dirname, followed by DEL filename. And another DIR. Little wonder no one has the time and patience to keep their hard disk in order.

DR.COM will change all that. When you simply enter DR at the DOS prompt, you'll quickly get an alphabetically sorted, DOS-format listing of your current directory, and on the right of the screen you'll find a menu full of the file functions you'll need. A movable highlight bar controlled by the keypad cursor keys lets you thumb forward and backward through the directory. Park the bar on a file of interest, hit the appropriate function key from the menu list, and DR will either pop up the file for viewing, delete it, or rename it.

By adding parameters, you can sort the initial DR directory display in five different ways. Its full syntax is

DR [d:] [directory] [/E] [/S] [/D] [/T] [/O]

The switch characters (a slash followed by a letter) tell DR which way it should sort your directory. DR defaults to sorting by filename, essentially alphabetizing the listing. The /E switch instructs DR to sort by Extension. /S sorts by Size and either /D or /T sorts by Date. If you want to see a directory's filenames listed in the DOS DIR order, just put /O on the command line.

Don't worry if you can't remember the switches. All the sort functions (except O) are also listed in the DR menu.

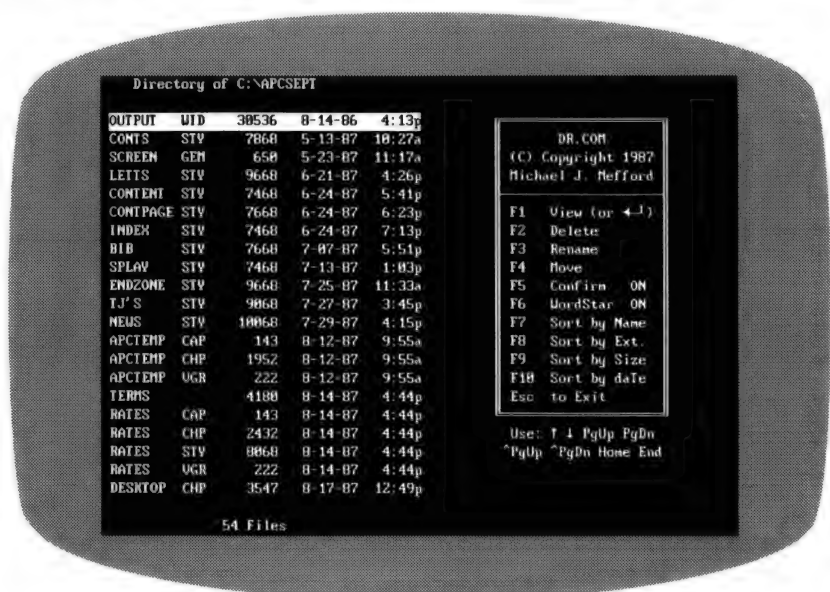
Unlike DIR, which scrolls off into never-never land, DR gives you complete control over the directory listing display. The Up and Down Arrow keys scroll the highlight bar a line at a time, while PgUp and PgDn flip to the next group of 21 filenames that DR displays at once. Ctrl-PgUp and Ctrl-PgDn take you to the top and bottom of the current page, and the Home and End keys take you to the beginning and end of the directory.

DR has an additional search feature that quickly puts the highlight bar on

the first filename that starts with a particular character. With a DR display on the screen, pressing 'P' will take you to the first filename that begins with the letter 'P', for example. Successively pressing 'P' will take you forward through all the filenames that begin with that letter. If you've sorted by anything but the default alphabetized listing, this can be a quick way to find a particular file.

Fully functioned

DR takes advantage of all ten function keys. F1 through F6 control the action taken on the highlighted filename. If



The DR screen menu with a typical page of directory listings

you press F1 (or the Enter key), the currently highlighted file is instantly brought on-screen for viewing. Once inside the file, the Up and Down Arrows continue to scroll the display one line at a time, and PgUp and PgDn move you to the previous or the next page. Either Ctrl-PgUp or Home takes you to the top of the file and, as you would expect Ctrl-PgDn or End puts you at the bottom of the file.

When you're through viewing, another tap on F1, or the Enter key or the Esc key, exits back to the menu. Indeed, as it should in all applications, each press of the Esc key takes you back one step in each DR module. Pressing Esc from the directory listing returns you to the DOS prompt. You can thus pop in and out of files for perusal with a minimum of keystrokes and never again have to resort to the DOS TYPE command or, for that matter, be bothered with typing the name of the file.

If you decide the file you just viewed is ready for the bourn of no return, press F2 to delete it. As a check, before deleting the highlighted file, DR requests verification — 'Y' to confirm that the file should be deleted, 'N' or Esc to cancel your delete command. If you don't want to be queried each time, you can press F5 to eliminate the confirmation step. (F5 is an on-off toggle; the default is Confirm ON.) If you turn Confirm OFF and press F2, the deletion is instantaneous. After deleting a file, DR tidies up by removing the filename from its listing and decrementing the file count it displays.

F3 lets you Rename a file and F4 is to Move a file to another directory. When you press F3, you are prompted for a new name for the highlighted filename. Your response cannot contain the path characters '.' and '\', nor the wildcard characters '?' or '*'. Once you have entered the desired new name, press Enter. If you have christened the file with a valid name, the new name will replace the old one both on the disk and in the DR listing. Otherwise, you probably entered an invalid filename character such as space and DR will complain with that annoying beep. If you pressed F3 and wish to change your mind in midstream, hit the dependable rip cord, the Esc key.

F4, Move a file to another directory, is particularly useful if you use one directory as a dumping ground for files that must later be sorted into their appropriate cubbyholes. When you press F4, you are prompted for a new directory for the highlighted file. Note that you cannot move a file to another

drive, nor can you move to a directory that already has a same-named file. The latter entails copying, a function that is not included in DR. If you want to move a file to another directory and also give it a new name, first press F3, Rename the file, and then F4, Move. Confirmation of a successful move is the same as when you delete a file. The name will be removed from the directory listing. Don't panic. Your file is not lost, just in the new directory, where you wanted it.

F6 is the WordStar toggle. WordStar and some other word processors set the high bit of an ASCII character on to control page formatting, causing a normal text character to be displayed as a graphics character. DR by default strips this high bit so that even these text files will look normal when using the View function. However, if the file you wish to view has graphic characters you wish displayed as graphic characters, press F6 and the 'ON' next to the WordStar will be toggled 'OFF',

'You can pop in or out of files for perusal with a minimum of keystrokes and never again resort to the TYPE command or be bothered with typing the name of the file.'

and DR will leave the high bit alone. The WordStar toggle does the same thing as Ctrl-QG in SideKick's Notepad.

The last four functions of DR control the different ways you can Sort the directory listing. These functions are F7, Sort by Name; F8, Sort by Extension; F9, Sort by Size; and F10, Sort by DaTe. Unlike the DOS SORT.COM, the Date sort correctly handles the old problem of sorting by year as well as month, date, and finally time. You might use F8, Sort by Extension, if you were just interested in your .BAK files, for example.

The Sort functions can be used in combination with other functions. For example, if you want to see the latest file updates, press F10, Sort by DaTe, and immediately press End to take you to the end of the listing. Or if you want to see all your .COM files sorted by size, press F7, Sort by Size, and then F8, Sort by Extension.

All the DR functions except Confirm

will also accept a Ctrl-letter command entry. This means that while depressing the Ctrl key you have the option of pressing V (or Enter) to View, D to Delete, R to Rename, M to Move, W to toggle to WordStar high bit, N to sort by Name, E to sort by Extension, S to sort by Size, and T to sort by DaTe. Confirm was omitted from the Ctrl-letter alternative to help protect against accidental deletion.

An additional touch I think you'll appreciate is that the Delete, Rename, and Move functions work directly while you are Viewing a file. For example, if while in View mode you decide that the file should go, instead of returning first to the menu with Esc, just press F2 and you will be automatically returned to the menu's confirm deletion prompt. (This assumes the Confirm toggle is 'ON'. If 'OFF', DR will not pause before deletion.)

Getting DR

If you haven't yet bought a modem, DR.COM should push you to the decision point. At roughly 3k, it's considerably the largest utility APC has presented to date, and accurately typing in either DR.ASM (Fig 1) or DR.BAS (Fig 2) may prove rather difficult. The .COM, .ASM, and .BAS versions of DR are easily downloaded by modem from Microtex on Telecom's Viatel (page *6663#) or by sending a stamped self addressed package containing a blank disk marked DR.COM, C/- APC, 124 Castlereagh Street, Sydney 2000.

Application notes

I think you will find many other everyday uses for DR aside from cleaning up a directory. First of all, you will probably want to use DR as a replacement for the DOS DIR command — and you know how often you enter that. The two main advantages DR has over DIR are its speed and the ability to scroll forward as well as backward through the listing.

Finding a file from an alphabetised list is faster and easier than ploughing through a DOS DIR listing. DR also comes in handy for quick perusal of .DOC and README files that often come on a new disk. Browsing through a whole directory of files may be the handiest use of DR.

DR uses an 80-column line wrap format to display files. What that means is that DR keeps displaying one line until it either encounters a carriage return or gets to the last column of an



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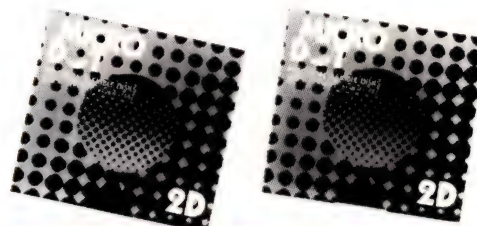
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- 20 Dedicated function keys
- Enlarged "Return" and "Shift" key
- Positive feel keys
- Low Profile Design, DIN standard
- Separate Numeric and Cursor control keypads
- Additional Functions...
- Key-in-lock, Audio Beep, Previous Word, Next Word, Fast Repeat, Line Feed, Pause, Clear Screen, Reset.

Cat.X12022 WAS \$299
SPECIAL, ONLY \$199



"IBM® AT COMPATIBLE" KEYBOARD

- 100% IBM® PC, XT compatible
- Low profile keyboard design
- Proper placement of shift keys with large top keys to suit professional typists.
- 3 step height angle adjustment
- Cherry brand TS-M00001 19mm low profile switches, meet 30mm ergonomic requirement and provides high performance and maximum reliability.
- Curl lead plugs straight into PC/XT
- 3 Status displays

Just like the "Real McCoy" only at a fraction of the price!
Cat.X12020 only \$129



JUMBO 5 1/4" DISK STORAGE

If you've got lots of disks, you'll appreciate the extra capacity of this disk storage unit when it comes to locating "that" disk!

- 100 disk capacity
- Smoked plastic cover
- Lockable (2 keys supplied)
- 9 Dividers/spacers

C16020 only \$19.95
C16027 (Hinged Lid) \$19.95



5 1/4" DISK STORAGE

Efficient and practical. Protect your disks from being damaged or lost!

- 70 disk capacity
- Smoked plastic cover
- Lockable (2 keys supplied)
- Dividers/spacers

Cat. C16025 only \$17.95



3 1/2" DISK STORAGE UNIT

- Holds up to 40 x 3 1/2" diskettes
- Lockable (2 keys supplied)
- High impact plastic lid and base
- Anti static

Cat. C16040 only \$17.95



3 1/2" DISK STORAGE UNIT

- Holds up to 40 x 3 1/2" diskettes
- Lockable (2 keys supplied)
- High impact plastic lid and base

Cat. C16035 only \$17.95



DB25 CONNECTOR SPECIALS!

We have just imported 50,000. So you get to save a small fortune!

DB25 MALE (P10900)

1-9 \$1.00
10+ \$0.90
100+ \$0.80

DB25 FEMALE (P10901)

1-9 \$1.20
10+ \$1.00
100+ \$0.90



RS232 BREAK OUT BOX

A simple way of monitoring RS232 interface lead activity. Interface powered, pocket size for circuit testing, monitoring and patching. 10 signal powered LED's and 2 spares. 24 switches enables you to break out circuits or reconfigure and patch any or all the 24 active positions.

SPECIFICATIONS:
Connectors: DB25 plug on 80mm ribbon cable and DB25 socket.
Indicators: Tricolour LED's for TD, RD, RTS, CTS, DSR, CD, TC, RC, DTR, (E)TC.
Jumper Wires: 20 tinned end pieces.
Power: Interface power.
Enclosure: Black, high impact plastic.
Dimensions: 85 x 95 x 30mm
X15700 \$94.95



RS232 FAST CABLER

Makes RS232 interface configuring fast and simple. 3 slide switches enable line swapping functions, positive and negative voltages are displayed on 6 tricolour LED's.

SPECIFICATIONS:
Connector: DB25 plug on 100mm cable and DB25 socket on 100mm cable.
Indicators: Tricolour LED's for pins 2(TD), 3(RD), 4(RTS), 5(CTS), 6(DSR), 20(DTR).
Switches: 3 Slide switches to swap leads.
Power: Interface power.
Enclosure: Black, high impact plastic.
Dimensions: 85 x 95 x 30mm
X15710 \$145



SEMICONDUCTORS!

Always check our prices before you buy!

	1-9	10+	100+
2114	\$2.95	\$2.75	\$2.50
2716	\$9.95	\$9.50	\$8.95
2732	\$8.95	\$8.50	\$7.95
2764	\$7.95	\$7.50	\$6.95
27128	\$9.95	\$8.95	\$7.95
27256	\$11.50	\$10.50	\$10.00
27512	\$19.50	\$18.50	\$17.50
4116	\$3.95	\$3.50	\$2.95
4164	\$3.95	\$3.25	\$2.75
41256	\$7.95	\$6.95	\$5.95
5558pin	\$0.50	\$0.40	\$0.35
6116	\$3.95	\$3.75	\$3.50
6264	\$7.95	\$6.95	\$6.50
6802	\$5.00	\$4.00	\$3.75
6821	\$2.00	\$1.80	\$1.70
6845	\$5.00	\$4.00	\$3.75
7406	\$0.40	\$0.30	\$0.25
INS8250	\$29.95	\$27.95	

NE5534AN SCOOP PURCHASE!!!

1-9 \$1.95
10+ \$1.85
100+ \$1.75

WORLD MODEM CHIP

Cat. U21614 Normally \$49.50
Save \$25, SPECIAL \$24.95

MEL9501

Have you blown up your Apple drive by plugging it in backwards or not turning off the power while changing boards? We have the MEL9501 chip! SPECIAL, ONLY \$29.95

8087

Genuine Intel chips with manual and data sheets packed in boxes!
8087-3 (4.77MHz) \$269
8087-2 (6MHz) \$385
8087-1 (10MHz) \$585
80287-6 (6MHz) \$475
80287-7 (8MHz) \$679



DB9 GENDER CHANGERS

- Saves modifying or replacing non mating DB9 connections
- All 9 pins wired straight through
- X15640: Male to male
- X15641: Male to Female
- X15642: Female to Female

..... only \$14.95



DB15 GENDER CHANGERS

- Saves modifying or replacing non mating DB15 connections
- All 15 pins wired straight through
- X15645: Male to male
- X15646: Male to Female
- X15647: Female to Female

..... only \$14.95



RS232 GENDER CHANGERS

- Saves modifying or replacing non-mating RS232 cables
- All 25 pins wired straight through
- Cat. X15650 Male to Male
- Cat. X15651 Male to Female
- Cat. X15652 Female to Female

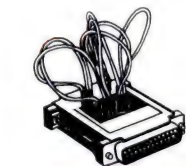
Normally \$14.95 each
Only \$9.95



RS232 INLINE SWITCHING BOX

- 25 pin "D" plug to 25 pin "D" socket
- DIP switches allow easy switching of internal wiring

Cat. X15662 \$32.95



RS232 WIRING ADAPTOR BOX

- Male to female
- 25 Detachable plug on leads
- 2 mini jumpers
- Ideal for experimenting or temporary connections

Cat. X15665 Normally \$49.95
Only \$44.95



CENTRONICS GENDER CHANGERS

- Female to Female
- Saves modifying or replacing non-mating Centronics cables
- All 36 pins wired straight through
- Cat. X15663 Male to Male
- Cat. X15661 Male to Female
- Cat. X15664 Female to Female

Normally \$33.95
Only \$24.95

ROD IRVING ELECTRONICS!



NEC DISK DRIVES

3 1/2" DISK DRIVE

- 1 M/Byte unformatted, (640K formatted).
- Double sided, double density.
- Access Time 3m/sec

Cat. C11906 \$265

5 1/4" SLIMLINE

- Switchable 1.6 M/Byte to 1 M/Byte unformatted
- 1.2 M/Byte to 720K formatted
- Double sided, double density.
- AT compatible

Cat. C11906 \$295

8" SLIMLINE

- Double sided, double density.
- 1.6 M/Byte unformatted.

Cat. C11908 \$795



IBM* COMPATIBLE DISK DRIVES

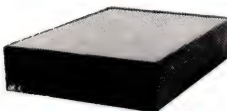
Tired of paying out more for Japanese Disk Drives? These "direct import" Hong Kong disk drives are the solution! They feature Japanese mechanical components, yet cost only a fraction of the price!

Cat.No. Description Price
C11801 500K Normally \$199
SPECIAL, ONLY \$179
C11805 1.6 M/Byte \$259



20 M/Byte HARD DISK DRIVE FOR IBM* AND COMPATIBLES

Drive with DTC controller card.
Cat. X20020 WAS \$850
SPECIAL, ONLY \$750
*IBM is a registered trade mark.



APPLE* COMPATIBLE SLIMLINE DISK DRIVE

Compatible with Apple 2+
Cat. X19901 Normally \$225
SPECIAL \$179

APPLE* IIC COMPATIBLE DISK DRIVE

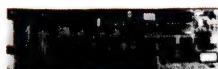
(including cable only \$199
(*Apple is a registered trade mark)



SWIVEL BASE

Make life easier with these quality, swivel and tilt bases, complete with rubber fittings!

Cat. D11100 \$24.95



IBM* XT COMPATIBLE CARDS

NEW! NEW! NEW! NEW!

20M/Byte HARD DISK CARD
XT compatible, simply plugs straight in to your computer!
Cat. X20020 \$1,095

Colour Graphics Card
Cat. X18002 \$109

Mono Graphics/Printer Card
(Hercules compatible)
Cat. X18003 \$119

Floppy Disk Drive Controller Card
(2 Drives, 16 Bit)
Cat. X18005 \$52

Floppy Disk Drive Controller Card
(4 Drives, 16 Bit)
Cat. X18006 \$57

High Resolution Mono Card
Cat. X18007 \$199

Colour Graphics & Printer Card
Cat. X18010 \$119

768KB RAM Card (without memory)
Cat. X18012 \$79

Printer Card
Cat. X18017 \$34.95

Game I/O Card
Cat. X18019 \$37.95

XT Motherboard 4.77MHz
Cat. X18020 (without memory) \$189

XT Turbo Motherboard 8MHz
Cat. X18030 (without memory) \$199

Clock Card
Cat. X18024 \$57.50

RS232 Card (without cable)
Cat. X18026 \$52.50

RS232 & Clock Card
Cat. X18028 \$95

Multi I/O & Disk Controller Card
Cat. X18040 \$169

I/O Plus Card
Cat. X18045 \$129

768K Multifunction I/O Card
(includes cable but not 41256 RAM)
Cat. X18050 \$199

Enhanced Graphics Adaptor Card
256K RAM on board
Cat. X18070 \$295

64K Printer Buffer Card
Cat. X18070 \$139

(AT COMPATIBLE)

Enhanced Graphics Adaptor Card
(Award Bios)
Cat. X \$495



APPLE* COMPATIBLE CARDS

PRINTER CARD
Cat. X17029 \$89

DRIVE CARD
Cat. X17019 \$79

80 COLUMN CARD
Cat. X17025 \$85

SUPER SERIAL CARD
Cat. X17035 \$119

RGB CARD
Cat. X17039 \$79

PAL COLOUR CARD
Cat. X17027 \$95

280 C/M CARD
Cat. X17041 \$59

APPLE* IIC COMPATIBLE CARDS

80 COLUMN/64K CARD
Cat. X \$99

64K/128K CARD
Cat. X \$99

PRINTER LEAD FOR IBM*

• Suits IBM* PC XT and compatibles
• 25 pin "D" plug (computer end)
to Centronics 36 pin plug
Cat. P19029 1.8 metres \$17.95
Cat. P19030 3 metres \$22.95



SAMSUNG 12" 20MHz COMPOSITE MONITOR ONLY \$149

FEATURES....
• High contrast, non-glare screen
• High resolution, 80 or 40 character display

SPECIFICATIONS....
Picture tube: 12" diagonal and 90° deflection

Phosphor: Available in Green (P39) or Amber

Video input signal: Composite Signal
Polarity: Negative Sync.
Level: 0.5V-2.0Vp-p

Scanning frequency:
Horizontal: 15.734 KHz + -0.1%
Vertical: 60Hz

Video bandwidth: 20MHz
Active display area:
216(H) x 160(V)mm

Display character:
80 characters x 25 rows

Input terminal: RCA Phono Jack
Controls:
Outside: Power Switch, Contrast, Brightness, H-Shift, V-Size.

Inside: H-Width, H/V hold, H/V linearity, Focus.
Power supply: 110/120V 60Hz, 220/240V 50Hz

Dimensions:
308(W) x 307(H) x 297(L)mm

Weight: 7.3 Kg
Shipping weight: 8.3 Kg

Cat.No. Description Price
X14514 (GREEN) \$149
X14516 (AMBER) \$149



ANTI GLARE SCREEN

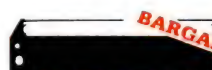
Half the price of other brands!!
Relieve eye strain and headaches and increase productivity with these Anti Glare Screens. Suitable for 12" monochrome.

Cat. X99995 \$24.95



SENDATA DIRECT CONNECT MODEM

• CCITT V21 300 baud full duplex
• CCITT V23 1200/75
• Bell 103 300 Full duplex
• Bell 202 1200 Half duplex
• Auto answer, auto disconnect
• LED display for Power, TX, RX, CD
• AC power adaptor included
• DB25 pin connector
• Telecom Approval N° CB37/1045
Cat. X19120 \$295
(SOFTWARE FOR VIATEL \$95)



PRINTER RIBBONS

CP80, BX80, DP80, BX100, MB100

ALL A CRAZY LOW \$9.95

PRINTER RIBBONS TO SUIT EPSON MODELS...

MX100, FX100, RX100
(Cat. C22002) \$19.95
MX70/80, FX70/80, RX70/80
(Cat. C22031) \$10.95



SAMSUNG TTL 12" MONITOR

- High contrast, non-glare screen
- Excellent value for money!

SPECIFICATIONS:
Picture tube: 12" diagonal 90° deflection

Mode: TTL
TTL input signal:
Polarity: TTL Positive
Level: 4V p-p -1 -1.5V

Impedance: 75ohm
Video bandwidth: 16MHz (-3dB)

Scanning frequency:
Horizontal: 18.432 + -0.1 KHz
Vertical: 50Hz + -0.5%

Active display area:
216(H) x 160(V)mm

Display characters:
80 characters x 25 lines

Input connector: 9 pin connector

Controls:
Front: Power ON/OFF, Contrast, Brightness, Signal Select, V-Hold, V-Size, Brightness

Internal: Vertical Linearity, Horizontal Linearity, Horizontal Width, Focus

Power supply: 110/120V 60Hz, 220/240V 50 Hz

Dimensions:
308(W) x 297(H) x 307(L)mm

Weight: 7.3Kg
Shipping weight: 8.3Kg

Cat.No. Description Price
X14500 (GREEN) \$189
X14502 (AMBER) \$189



MAIL ORDER HOTLINE

008 335757 (TOLL FREE)
LOCAL: 543 7877



SAKATA 13" RGB COLOUR MONITOR

High quality IBM* compatible monitors, great with VCR's too!

SPECIFICATIONS:
CRT: 13", 90° deflection colour

Input Signal:
Video Signal: Separate video signal
Video: Positive
Sync.: Positive

Input Level: TTL Level
Scanning Frequency:
Horizontal: 15.7KHz
Vertical: 60Hz

Display Size: 245(H) x 182(V)mm
Resolution:
Horizontal: 640 dots
Vertical: 200 lines

Size: 343(H) x 362(V) x 421(D)mm
Weight: 11.6kg

Cat. X14530 \$695



PAPER TAMER

• Restores order to the top of your desk or work area
• Made of white plastic coated steel
• Stores up to 900 continuous sheets
• Allows perfect paper feed
• Allows easy examination of print out
C21050 (10") only \$49.95
C21050 (15") only \$79.95
(Printer and paper not included)



SAMSUNG 12" TTL/COMPOSITE MONITOR

FEATURES....
• At last a monitor with both TTL and Composite modes!

• High contrast, non-glare screen

• High resolution, 80 or 40 character display

• Swivel/Tilt base

SPECIFICATIONS....
Picture tube: 12" diagonal and 90° deflection

Phosphor: Green (P42)

Video input signal: Composite/TTL Switchable

Polarity: Negative/Positive
Level: 0.5-2.0Vp-p 4.0-1.5Vp-p

Impedance: 75ohm, more than 6.8K ohm

Scanning frequency:
Horizontal: 15.734 KHz + -0.1%
Vertical: 50-60Hz

Video bandwidth: 20MHz
Active display area:
216(H) x 160(V)mm

Display character:
80 characters x 25 rows

Input terminal: Phono Pin Jack, 9 pin D-Sub Connector

Controls:
Outside: Power Switch, Contrast, Brightness, Signal Select, V-Hold, V-Size

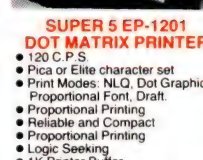
Inside: H-Width, H/V linearity, Focus, H/V-Shift

Power supply: 110/120V 60Hz, 220/240V 50Hz

Dimensions:
308(W) x 297(H) x 307(L)mm

Weight: 7.3 Kg
Shipping weight: 8.3 Kg

Cat.No. Description Price
X14509 (GREEN) \$239



SUPER 5 EP-1201 DOT MATRIX PRINTER

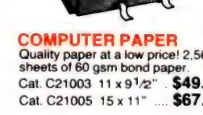
- 120 C.P.S.
- Pica or Elite character set
- Print Modes: NLQ, Dot Graphics, Proportional Font, Draft.
- Proportional Printing
- Reliable and Compact
- Proportional Printing
- Logic Seeking
- 1K Printer Buffer

Cat. C20035 only \$595

CANON A-50 PRINTER

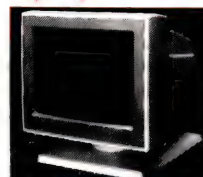
- Serial Impact Dot Matrix
- 180 C.P.S.
- Near Letter Quality Mode
- 1.4K Buffer

Cat. C20045 \$595



COMPUTER PAPER

Quality paper at a low price! 2,500 sheets of 60 gsm bond paper.
Cat. C21003 11 x 9 1/2" \$49.95
Cat. C21005 15 x 11" \$67.95



SAMSUNG 12" FLAT SCREEN COMPOSITE MONITOR

FEATURES....
• Flat, high contrast, non-glare screen

• High resolution, 80 or 40 character display

• Tilt/swivel base

• Compatible with Apple* and IBM* colour composite signal

SPECIFICATIONS....
Picture tube: 12" diagonal and 90° deflection

Phosphor: Available in Green or Amber

Video input signal: Composite Signal
Polarity: Negative Sync
Level: 0.5-2.0Vp-p

Impedance: 75ohm

Scanning frequency:
Horizontal: 15.734 KHz + -0.1%
Vertical: 50-60Hz

Video bandwidth: 20MHz
Active display area:
216(H) x 160(V)mm

Display character:
80 character x 24 rows

Input terminal: RCA Phono Jack

Controls:
Outside: Power Switch, Contrast, Brightness, H-Shift, V-Size

Inside: H-Width, H/V hold, H/V linearity, Focus

Power supply: 110/120V 60Hz, 220/240V 50Hz

Dimensions:
310(W) x 307(H) x 300(L)mm

Weight: 8.1 Kg
Shipping weight: 9.6 Kg

Cat.No. Description Price
X14510 (GREEN) \$249
X14512 (AMBER) \$249

Mail Order and Correspondence:

P.O. Box 620, CLAYTON 3168

Telex: AA 151938

Mail Order Hotline

008 335757 (TOLL FREE)

(STRICTLY ORDERS ONLY)

LOCAL ORDERS & INQUIRIES

(03) 543 7877

POSTAGE RATES:

\$1 - \$9.99	\$2.00
\$10 - \$24.99	\$3.00
\$25 - \$49.99	\$4.00
\$50 - \$99.99	\$5.00
\$100 - \$199	\$7.50
\$200 - \$499	\$10.00
\$500 plus	\$12.50

FREE POSTAGE FOR ORDERS OVER \$75 & UNDER 1KG!!

The above postage rates are for basic postage only. Road Freight, bulky and fragile items will be charged at different rates.

All sales tax exempt orders and wholesale inquiries to: RITRONICS WHOLESALE, 56 Renner Rd, CLAYTON, Ph. (03) 543 2166 (3 lines)

Errors and omissions excepted

*Apple and IBM are registered trade names.



PRODUCTIVITY

```

; DR.asm
; Format: DR [d:] [directory] [/E] [/S] [/D] [/F] [/O]

CODE SEGMENT
ASSUME CS:CODE,DS:CODE
ORG 100H

START: JMP BEGINNING

;-----
; DATA AREA
;-----
DB 'Copyright 1987 Riff-Davis Publishing Co.'
DB 'Michael J. Mefford'

CURRENT_DISK DB ?
STATUS_REG DW ?
VIDEO_SEG DW 0B000H
NORMAL DB 07H
INVERSE DB 70H
BAR_ATTRIBUTE DB 70H
CURSOR_TYPE DW ?

SORT_OFFSET DW 0
SORT_TABLE DW 0,12,9,3,13,8,29
SORT_FLAG DB 0
CUR_OFFSET DW BUFFER
CUR_FILE DW ?
END_OFFSET DW ?
PAGES DW ?
PAGE_END DW 21*160+323
COUNT DW 1
LINE DW 323
STAR_DOT_STAR DB '*.*',0
VERIFY_FLAG DB 1
WORDSTAR_BIT DW 7FH
SEARCH_COUNT DW ?

DISPATCH_KEY DB 1,11H,12H,13H,14H,1CH,1FH,20H,2FH,31H,32H,3BH,3CH,3DH,3EH
DB 3FH,40H,41H,42H,43H,44H,47H,48H,49H,4FH,50H,51H,76H,84H

DISPATCH_TABLE DW EXIT, WORDSTAR, SORT_EXT, RENAME, SORT_DATE, VIEW
DW SORT_SIZE, DELETE, VIEW, SORT_NAME, MOVE, VIEW
DW DELETE, RENAME, MOVE, VERIFY, WORDSTAR, SORT_NAME
DW SORT_EXT, SORT_SIZE, SORT_DATE, HOME_BAR, UP_ARROW
DW PG_UP, END_BAR, DN_ARROW, PG_DN, BOTTOM_BAR, TOP_BAR

VIEW_TABLE DW HOME_FILE, UP_LINE, UP_PG, END_FILE
DW DN_LINE, DN_PG, END_FILE, HOME_FILE

DISPLAY_FLAG DB ?
ROW DB 0
FILE_END DW ?
FILE_HANDLE DW ?
LAST_PAGE DW ?

NOT_ENOUGH DB 'Not enough memory!'
INVALID DB 'Invalid directory!'
TOO_MANY DB 'Too many files!'
LOADING DB 'Loading and Sorting directory.',0
LOAD_ONLY DB 'Loading directory.',0
DIRECTORY DB 'Directory of ',0
FILES DB 'Files',0
DELETE_MSG DB 'Will be deleted.',0,'Do you wish to delete it? Y/N',0
RENAME_MSG DB 'Enter new name for ',0
MOVE_MSG DB 'Enter new directory for ',0
ON DB 'ON',0
OFF DB 'OFF',0
BS DB 8,32,0,0

FILE_BUFFER EQU 32767-256
SIXTEEN_K EQU 16384

MENU LABEL BYTE
DB 201,20 DUP (205),187,186,' DR.COM ',186
DB 186,' (C) Copr. 1987 ZD ',186,186,' Michael J. Mefford ',186
DB 199,20 DUP (196),182,186,' F1 View (or ',17,196,217,') ',186
DB 186,' F2 Delete ',186,186,' F3 Rename ',186
DB 186,' F4 Move ',186,186,' F5 Confirm ON ',186
DB 186,' F6 WordStar ON ',186,186,' F7 Sort by Name ',186
DB 186,' F8 Sort by Ext. ',186,186,' F9 Sort by Size ',186
DB 186,' F10 Sort by Date ',186,186,' Esc to Exit ',186
DB 200,20 DUP (205),188,' Use: ',24,32,25,' PgUp PgDn
DB 'PgUp PgDn Home End '

;-----
; Some housekeeping first. Since we will be changing the default drive
; and directory to the requested drive and directory, we need to save the
; current defaults, so they can be restored. If less than 64K, exit.
;-----

;-----
; CODE AREA
;-----
BEGINNING: MOV AX,3301H ;Turn Control Break off.
MOV DL,0
INT 21H

CLD ;String moves forward.
MOV AH,19H ;Get current drive.
INT 21H
MOV CURRENT_DISK,AL ;And save.

;-----
; More housekeeping. We will be writing directly to the screen buffer ;
; so we need the display card address and the status register.
;-----

DISPLAY: MOV AX,40H ;Point to the ROM BIOS data area
MOV DS,AX ; and get base address of active
MOV AX,DS:[63H] ; display card.
ADD AX,6 ;Add six to get status register
PUSH CS ;Done there, so restore data segment.
POP DS
MOV STATUS_REG,AX ;Store status register.
CMP AX,3BAH ;Status port of MONO card is 3BAh.
JZ MONO ;If that's what we got, it's MONO
MOV VIDEO_SEG,0B800H ; else COLOR so add 800h.
XOR BH,BH ;Get current attribute
MOV AH,8 ; of display page zero.

MONO: INT 10H ;Store it.
MOV NORMAL,AH ;Flip color bits.
XOR AH,1110111B ;Save it.
MOV INVERSE,AH
MOV BAR_ATTRIBUTE,AH
XOR BH,BH
MOV AH,3 ;Retrieve cursor type.
INT 10H
MOV CURSOR_TYPE,CX

;-----
; Do we have 64K?
;-----
CMP SP,65533
MOV DX,OFFSET NOT_ENOUGH ;Do we have 64K?
JA PARSE ;If yes, parse.
JMP ERROR_EXIT ;If no, exit.

;-----
; Parse the command line for parameters.
;-----
PARSE: CMP BYTE PTR DS:[80H],0 ;Any parameters?
JNZ GET_SWITCH ;If yes, parse.
JMP MESSAGE ;Else, skip.

GET_SWITCH: MOV SI,81H ;Else, point to first character.
NEXT_SWITCH: LODSB ;Get a byte.
CMP AL,13 ;Carriage return?
JZ GET_PARA ;If yes, done here.
CMP AL,'/' ;Is it switch character?
JNZ NEXT_SWITCH ;If no, get next character.
LODSB ;Get switch character.
AND AL,5FH ;Capitalize.
CMP AL,'E' ;If "E", sort by extension.
JNZ CK_SIZE ;If "S", sort by size.
MOV MOV SORT_OFFSET,8 ;If "D", sort by date.
CMP AL,'D' ;If "T", sort by date.
JZ GOT_DATE ;If "O", don't sort at all.
CMP AL,'O' ;If "O", don't sort at all.
MOV GET_PARA ;Point to first character.
NEXT_PARSE: MOV SI,81H ;Carriage return or slash?
CMP AL,13 ;If yes, done here.
JZ MESSAGE ;Leading space?
CMP AL,32 ;If yes, get next byte.
JBE NEXT_PARSE ;Save start.
PUSH SI
NEXT_PARA: LODSB
CMP AL,32 ;End of parameter?
JBE END_PARA ;If yes, done here.
CMP AL,'/'
JZ END_PARA
CMP AL,';'
JNZ NEXT_PARA ;Drive request?
MOV DL,BYTE PTR [SI-2] ;If no, get next byte.
AND DL,5FH ;Else, retrieve request.
SUB DL,'A' ;Capitalize.
MOV AH,0EH ;Convert to DOS format.
INT 21H ;And change drive.
JMP SHORT NEXT_PARA ;Find end of parameter.

END_PARA: MOV MOV BYTE PTR DS:[SI-1],0 ;Convert parameter to ASCIIIZ.
BL,BYTE PTR DS:[SI-2]
MOV SI,OFFSET CURRENT_DIR ;Get current directory.
CALL GET_DIR
POP DX ;Retrieve start.
DEC DX ;Adjust.
CMP BL,';' ;Is it a drive request?
JZ MESSAGE ;If yes, skip directory change.
CMP BL,32 ;Is it a delimiter?
JBE MESSAGE ;If yes, skip.
MOV AH,3BH ;Change directory.
INT 21H
MOV DX,OFFSET INVALID ;If error, exit.
JC ERROR_EXIT

MESSAGE: CALL CLS ;Clear screen.
CALL CURSOR_OFF ;Cursor off.
MOV SI,OFFSET LOADING ;Display sorting message.
MOV DX,8C19H
CMP SORT_FLAG,1 ;Unless not sorted.
JNZ DISP_MSG ;Then display loading message.
MOV SI,OFFSET LOAD_ONLY
MOV DX,0C1FH
CALL DISPLAY_TEXT

DISP_MSG: MOV DI,OFFSET BUFFER ;Put space character
MOV CX,16000 ; in directory listing
MOV AX,2020H ; buffer.
REP STOSW

;-----
; Read all the directory filenames and store as records in buffer.
;-----
READ_DIR: MOV DX,OFFSET STAR_DOT_STAR
MOV CX,7
MOV AH,4EH ;Find first matching file.
INT 21H
JC EXIT ;If empty directory, exit.

STORE_NAME: MOV DI,OFFSET BUFFER ;Point to buffer.
MOV BP,FILE_BUFFER-200 ;Reserve 32K for file read buffer.

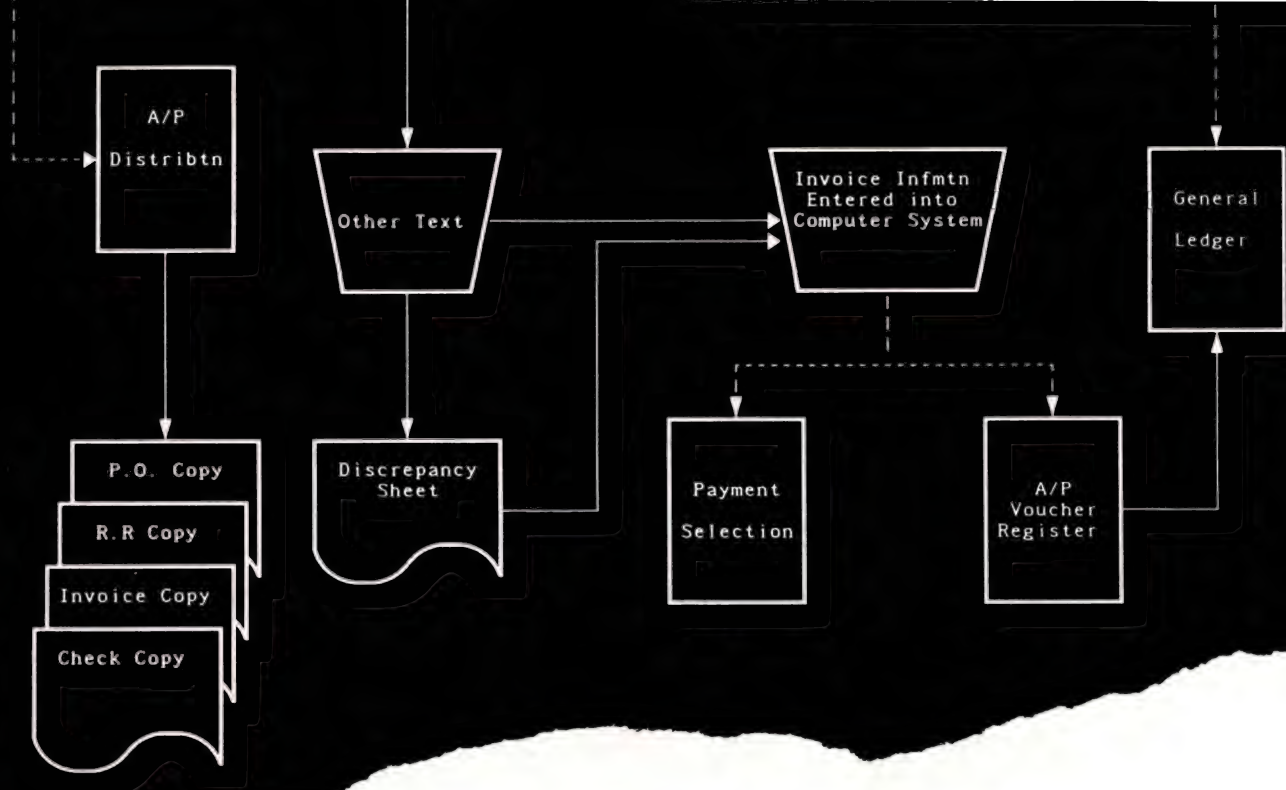
;-----
; Convert to directory format.
;-----
CALL BUFFER_NAME
FIND_NEXT: MOV AH,4FH ;Find next matching.
INT 21H
JC STORE_COUNT ;If carry, no more names.
INC COUNT ;Increment count of names.
CALL BUFFER_NAME
CMP DI,BP ;Are we encroaching file buffer?
JBE FIND_NEXT ;If no, find next.
MOV DX,OFFSET TOO_MANY ;Else, exit with message.

;-----
; This is the exit routine. Restore the defaults the way we found them.
;-----
ERROR_EXIT: MOV AH,9 ;Display error message.
INT 21H
JMP SHORT RESET

EXIT: CALL CLS ;Clear screen.
XOR DX,DX ;Set cursor top left.
CALL SET_CURSOR ;Turn cursor back on.
CALL CURSOR_ON

```

Fig 1 The assembly language source code for DR.COM



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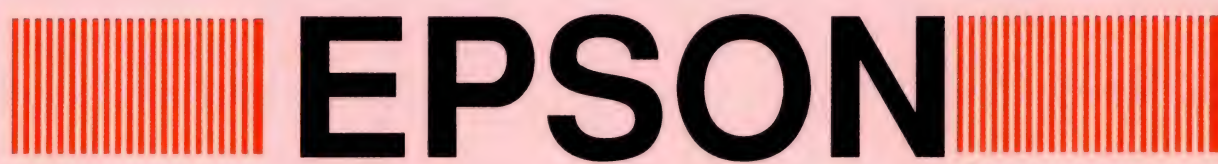
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```

RESET:      MOV     DX,OFFSET CURRENT_DIR ;Reset the directory.
            MOV     AH,3BH
            INT     21H
            MOV     DL,CURRENT_DISK      ;Reset the drive.
            MOV     AH,0EH
            INT     21H
            INT     20H

;-----
; Store buffer end address and page ;
; end then sort the filenames. ;
;-----

STORE_COUNT: MOV     END_OFFSET,DI      ;Store ending offset.
            ADD     DI,48
            MOV     PAGES,DI           ;Also, address for page storage..

            MOV     BX,COUNT            ;Retrieve file count.
            CMP     BX,21               ;Enough to fill one page?
            JAE     DO_SORT             ;If yes, use default setting.
            ADD     PAGES,888           ;Else, adjust page storage.
            MOV     AX,160              ;Calculate last record.
            MUL     BL
            ADD     AX,323              ;Add bar offset.
            MOV     PAGE_END,AX
            MOV     SORT_FLAG,1
            CMP     JI,READY
            CALL    SORT

DO_SORT:
;-----
; Now, we are ready to get target directory and display it and the menu. ;
;-----

```

```

READY:      MOV     DI,OFFSET PURGE_DIR ;Point to storage.
            MOV     AH,19H
            INT     21H                ;Get drive.
            ADD     AL,'A'              ;Convert to ASCII.
            STOSB
            MOV     AL,':'              ;Add colon.
            STOSB
            MOV     SI,DI               ;Get directory.
            CALL    GET_DIR
            CALL    REFRESH_DIR         ;Display drive, directory, menu.
;-----
; We are ready for business now. We will ;
; loop here, waiting for user keystrokes. ;
;-----

```

```

GET_KEY:    CALL    UPDATE_SCREEN
            CALL    READ_KEY
            MOV     BX,AX
            CMP     AH,1
            JBE     FUNCTION
            CMP     AH,36H
            JAE     FUNCTION
            CMP     AH,1CH
            JBE     FUNCTION
            MOV     AH,2
            INT     16H
            TEST    AL,4
            JNZ     FUNCTION
            CALL    SEARCH
            JMP     SHORT GET_KEY

FUNCTION:    MOV     DI,OFFSET DISPATCH_KEY
            MOV     AL,BH
            MOV     CX,29
            REPNE   SCASB
            JNE     GET_KEY
            MOV     DI,OFFSET DISPATCH_TABLE+56 ;If no match, get another.
            SHL     CX,1
            SUB     DI,CX
            CALL    DS:[DI]
            JMP     SHORT GET_KEY

;-----
; SUBROUTINES ;
;-----

```

These six subroutines control the bar and page of the directory listing.

```

UP_ARROW:   MOV     BP,-160
            JMP     SHORT BAR_MOVE

DN_ARROW:   MOV     BP,160
            JMP     SHORT BAR_MOVE

BAR_MOVE:   CALL    SCROLL_BAR
            RET

PG_UP:      MOV     BP,-40*21
            CALL    SCROLL
            JMP     SHORT BOTTOM_BAR

PG_DN:      MOV     BP,40*21
            CALL    SCROLL
            JMP     SHORT TOP_BAR

TOP_BAR:    MOV     CUR_OFFSET,OFFSET BUFFER ;Move listing to beginning.
            MOV     SI,323
            CALL    MOVE_BAR
            RET

END_BAR:    MOV     BX,END_OFFSET
            SUB     BX,21*40
            CMP     BX,OFFSET BUFFER
            JBE     BOTTOM_BAR
            MOV     CUR_OFFSET,BX
            MOV     SI,PAGE_END
            SUB     SI,160
            CALL    MOVE_BAR
            RET

BOTTOM_BAR:
;-----
; This subroutine searches for a filename with a specific first letter. ;
;-----

```

```

SEARCH:      CMP     BL,'a'
            JB      SEARCH_IT
            CMP     BL,'z'
            JA      SEARCH_IT
            AND     BL,5FH

SEARCH_IT:   CALL    GET_NAME
            XOR     DX,DX
            MOV     DI,SI
            MOV     SI,OFFSET BUFFER
            CMP     BYTE PTR [DI],BL
            JNE     NEXT_SEARCH
            INC     DX
            ADD     SI,40
            CMP     SI,DI
            JBE     FIND_START
            INC     DX
            ADD     SI,40
            CMP     SI,DI
            JBE     FIND_START

FIND_START:  INC     DX
            ADD     SI,40
            CMP     SI,DI
            JBE     FIND_START

NEXT_SEARCH: CMP     BYTE PTR [SI],BL
            JB      FOUND_IT
            ; If yes, process.

```

```

INC_SEARCH:  ADD     SI,40
            INC     DX
            CMP     BYTE PTR [SI],32
            JNZ     NEXT_SEARCH
            CALL    BEEP
            RET

FOUND_IT:    MOV     CX,COUNT
            SUB     CX,DX
            MOV     SEARCH_COUNT,CX
            MOV     CL,NORMAL
            MOV     BAR_ATTRIBUTE,CL
            CALL    END_BAR
            JMP     SHORT FIND_IT

NEXT_FIND:   CALL    UP_ARROW
            DEC     SEARCH_COUNT
            JNE     NEXT_FIND
            MOV     CL,INVERSE
            MOV     BAR_ATTRIBUTE,CL
            MOV     BP,BP
            CALL    SCROLL_BAR
            RET

```

This subroutine displays the highlighted file for viewing.

```

VIEW:        CALL    GET_NAME
            MOV     DX,OFFSET FILE_NAME
            INT     21H
            MOV     FILE_HANDLE,AX
            CALL    FIRST_READ
            MOV     LAST_PAGE,OFFSET FILE_BUFFER+SIXTEEN_K
            MOV     BP,PAGES
            MOV     ROW,0
            CALL    CLS

GET_VIEW:    MOV     SI,LAST_PAGE
            MOV     BH,ROW
            CMP     BH,0
            JZ      NEXT_VIEW
            MOV     DISPLAY_FLAG,0
            DEC     BH
            JNE     PAGE_OFFSET

NEXT_VIEW:   MOV     BH,25
            XOR     DI,DI
            MOV     DISPLAY_FLAG,1
            CALL    LINES
            JNE     VIEW_DISPLAY

VIEW_COMMAND: CALL    READ_KEY
            CMP     AH,1
            JZ      VIEW_END
            CMP     AH,1CH
            JZ      VIEW_END
            CMP     AH,3BH
            JZ      VIEW_END
            CMP     AH,2BH
            JZ      VIEW_DELETE
            CMP     AH,13H
            JZ      CK_RENAME
            JNZ     CK_MOVE
            CALL    VIEW_REQUEST
            JMP     RENAME
            CMP     AH,12H
            JZ      VIEW_MOVE
            CMP     AH,2EH
            JZ      GET_DISPATCH
            CALL    VIEW_REQUEST
            JMP     MOVE
            MOV     DI,OFFSET DISPATCH_KEY+21
            MOV     AL,AH
            MOV     CX,8
            REPNE   SCASB
            JNZ     VIEW_COMMAND
            MOV     DI,OFFSET VIEW_TABLE+14
            SHL     CX,1
            SUB     DI,CX
            CALL    DS:[DI]
            JC      VIEW_COMMAND
            JMP     GET_VIEW

VIEW_END:    MOV     BX,FILE_HANDLE
            MOV     AH,3EH
            INT     21H
            CALL    REFRESH_DIR

VIEW_REQUEST: CALL    VIEW_END
            CALL    UPDATE_SCREEN

;-----
; These six subroutines control the page and starting row of the view. ;
;-----

UP_LINE:     CMP     ROW,0
            JNE     DEC_ROW
            CMP     BP,PAGES
            STC
            JZ      UP_LINE_END
            CALL    UP_PG
            MOV     ROW,25
            DEC     ROW
            CLC
            RET

DEC_ROW:     CALL    UP_LINE_END
            CALL    CK_FILE_END
            JNC     CK_ROW
            RET
            CMP     ROW,24
            JB      INC_ROW
            CALL    DN_PG
            MOV     ROW,-1
            INC     ROW
            CLC
            RET

DN_LINE:     CALL    CK_FILE_END
            JNC     CK_ROW
            RET
            CMP     ROW,24
            JB      INC_ROW
            CALL    DN_PG
            MOV     ROW,-1
            INC     ROW
            CLC
            RET

UP_PG:       CMP     BP,PAGES
            JNE     DEC_PG
            CMP     ROW,0
            STC
            JZ      UP_PG_END
            MOV     ROW,0
            JMP     SHORT UPDATE_PAGE
            MOV     SI,LAST_PAGE
            ; Get current page.

```


PRODUCTIVITY

```

SUB      SI,DS:[BP]      ;Subtract difference to prev page.
CMP      SI,OFFSET FILE_BUFFER
JAE      UP_PG_RET       ;Beyond top of buffer?
CALL     BACKWARD        ;If no, page up.
JMP      SHORT DEC_PG    ;Else, read in previous 16K
UP_PG_RET: DEC BP        ;Try again.
DEC BP      ;Decrement page pointer.
MOV      LAST_PAGE,SI    ;Store new starting position.
UPDATE_PAGE: CLC
UP_PG_END: RET

DN_PG:    CMP      BP,65535-256 ;Out of room for page storage?
JAE      NOUPDATE_PG     ;If yes, skip.
MOV      SI,LAST_PAGE     ;Else, retrieve current page.
MOV      DISPLAY_FLAG,0   ;No display.
MOV      BH,25            ;Move up 25 lines.
NEXT_PAGE: CALL     DEC BH
JNZ      NEXT_PAGE
CALL     CK_FILE_END      ;End of file?
JC       NOUPDATE_PG     ;If yes, no update.
MOV      DX,LAST_PAGE     ;Else, save current offset.
MOV      LAST_PAGE,SI    ;Store new offset.
INC_PG:   MOV      AX,SI
SUB      AX,DX            ;Get difference between pages.
INC      BP              ;Increment page storage.
INC      BP
MOV      DS:[BP],AX      ;And store.
DN_PG_END: CLC
NOUPDATE_PG: RET

HOME_FILE: CALL     UP_PG      ;Page up until top of file.
JNC      HOME_FILE
CLC
RET

END_FILE:  CALL     DN_PG      ;Page down until end of file.
JNC      END_FILE
CLC
RET

;-----
; This subroutine checks to see if end of file has been reached. ;
;-----
CK_FILE_END: CMP     SI,FILE_END
JB       NOT_FILE_END
CMP      FILE_END,OFFSET FILE_BUFFER+(SIXTEEN_K * 2)
JAE      NOT_FILE_END
STC
RET

NOT_FILE_END: CLC
RET

;-----
; This subroutine formats the text into lines. A line is marked ;
; by either a carriage return or reaching the last column (80). ;
;-----
LINES:    MOV      CX,80      ;80 columns.
NEXT_LINES: CMP     SI,FILE_END ;If end of file, pad with spaces.
JB       GET_LINES
CMP      GET_LINES
CMP      FILE_END,OFFSET FILE_BUFFER+(SIXTEEN_K * 2)
JB       PAD_SPACES
PUSH     BX
PUSH     CX
PUSH     DI
CALL     FORWARD
POP      DI
POP      CX
POP      BX

GET_LINES: LODSB
AND      AL,WORDSTAR_BIT
CMP      AL,13
JZ       PAD_SPACES
CMP      AL,9
JZ       TAB
CMP      AL,10
JZ       NEXT_LINES
PUSH     CX
MOV      CX,1
CALL     CK_DISPLAY
POP      CX
NEXT_BYTES: LOOP    NEXT_LINES ;Get next byte.
CMP      BYTE PTR [SI],13 ;Is this a eighty column line?
JNZ      END_LINES      ;If no, skip.
INC      SI              ;Else, bump pointer past CR.
END_LINES: RET

TAB:      PUSH     CX
DEC      CX
AND      CX,7
INC      CX
CALL     PAD_SPACES
CALL     PAD_SPACES
POP      CX
SUB      CX,AX
JNZ      NEXT_LINES
RET

PAD_SPACES: MOV      AL,32
CK_DISPLAY: CMP      DISPLAY_FLAG,1 ;Space character.
JNZ      CK_DISP_END ;Are we to write it to screen?
MOV      BL,AL
WRITE_VIEW: CALL     WRITE_SCREEN ;If no, return.
LOOP    WRITE_VIEW
CK_DISP_END: RET

;-----
; These six subroutines control the page and starting row of the view. ;
;-----
FORWARD:  SUB      LAST_PAGE,SIXTEEN_K ;Adjust current page offset.
XOR      CX,CX
MOV      DX,SIXTEEN_K
CALL     MOVE_POINTER ;Move file pointer
MOV      SI,OFFSET FILE_BUFFER+SIXTEEN_K ;forward 16K.
MOV      MOVE_BUFFER
MOV      CX,-1
NEG      DX
CALL     MOVE_POINTER
RET

FIRST_READ: ADD      LAST_PAGE,SIXTEEN_K ;Adjust current page offset.
MOV      CX,-1 ;Move pointer back 32K.
DX, -(SIXTEEN_K * 2)
CALL     MOVE_POINTER
MOV      SI,OFFSET FILE_BUFFER
MOV      DI,OFFSET FILE_BUFFER+SIXTEEN_K ;Move first half of
CALL     MOVE_BUFFER ; buffer to second
RET ; and read 16K.

BACKWARD: ADD      LAST_PAGE,SIXTEEN_K ;Adjust current page offset.
MOV      CX,-1 ;Move pointer back 32K.
DX, -(SIXTEEN_K * 2)
CALL     MOVE_POINTER
MOV      SI,OFFSET FILE_BUFFER
MOV      DI,OFFSET FILE_BUFFER+SIXTEEN_K ;Move first half of
CALL     MOVE_BUFFER ; buffer to second
RET ; and read 16K.

```

```

MOVE_POINTER: MOV     BX,FILE_HANDLE
MOV     AX,4201H
INT     21H ;Move file pointer.
RET

MOVE_BUFFER: MOV     DX,SI
MOV     CX,SIXTEEN_K / 2 ;Save pointer.
REP     MOVSW ;Move 8K words (16K bytes).
MOV     BX,FILE_HANDLE
MOV     CX,SIXTEEN_K
MOV     AH,3FH
INT     21H ;Read 16K.
MOV     SI,DX
MOV     DX,AX
ADD     AX,OFFSET FILE_BUFFER+SIXTEEN_K
MOV     FILE_END,AX ;Store end of buffer offset.
RET

;-----
; This subroutine deletes the highlighted file. ;
;-----
DELETE:    CALL     GET_NAME ;Format the name for DOS.
JC       DELETE_ERROR ;If yes, skip.
CMP      VERIFY_FLAG,0 ;Are we to warn before deleting?
JZ       DELETE_FILE ;If no, skip.
MOV      SI,OFFSET FILE_NAME ;Else, display warning message.
MOV      DX,162DH
CALL     DISPLAY_TEXT
MOV      SI,OFFSET DELETE_MSG
CALL     GET_TEXT
MOV      DX,172DH
CALL     DISPLAY_TEXT

QUERY:     CALL     READ_KEY ;Get a keystroke.
CMP      AH,31H ;Is it "N"?
JZ       DELETE_END ;If yes, exit delete.
CMP      AH,1 ;Is it Esc?
JZ       DELETE_END ;If yes, exit delete.
CMP      AH,15H ;Is it "Y"?
JZ       DELETE_FILE ;If yes, delete.
CALL     BEEP ;Else, beep.
JMP      SHORT QUERY ;And get another keystroke.

DELETE_FILE: MOV     DX,OFFSET FILE_NAME ;Delete the file.
MOV      AH,41H
INT     21H
JC       DELETE_ERROR
CALL     REMOVE_FILE ;Remove the file from the listing.
CALL     CLEAR_MSG ;Remove warning message.
DELETE_END: RET
DELETE_ERROR: CALL     BEEP ;Beep if error.
CALL     CLEAR_MSG
RET

;-----
; This subroutine renames the highlighted file. ;
;-----
RENAME:    CALL     GET_NAME ;Format name for DOS.
JC       RENAME_ERROR ;If yes, skip.
MOV      DX,162CH ;Display rename message.
MOV      SI,OFFSET RENAME_MSG
CALL     DISPLAY_TEXT
MOV      SI,OFFSET FILE_NAME
CALL     GET_TEXT
MOV      DX,172CH
CALL     CLEAR_OLD ;Remove last entry.

NEW_NAME:  CALL     READ_KEY ;Get a character.
CMP      AL,27 ;Is it Esc?
JZ       RENAME_END ;If yes, exit rename.
CMP      AL,',' ;Ignore "i"?
JZ       NEW_NAME
CMP      AL,' ' ;Ignore " " ".
JZ       NEW_NAME
CMP      AL,'?' ;Ignore "i"?
JZ       NEW_NAME
CMP      AL,'.' ;Ignore "."
JZ       NEW_NAME
CMP      AL,13 ;Is it carriage return?
JZ       RENAME_IT ;If yes, rename it.
CMP      AL,8 ;Is it backspace?
JZ       NOT_BS1 ;If yes, backspace.
JMP      SHORT NEW_NAME
NOT_BS1:   CMP      AL,32 ;Is it space or above?
JB       NEW_NAME ;If no, ignore.
CMP      DI,8CH ;End of entry field?
JZ       NEW_NAME ;If yes, ignore.
STOSB ;Else, store byte.
CALL     WRITE_TEXT ;And write it to screen.
JMP      SHORT NEW_NAME ;Get next keystroke.

RENAME_IT: CALL     RENAME_FILE ;Rename the file.
JC       RENAME_ERROR ;Beep if illegal.
MOV      DX,80H ;Else, place new name in listing.
MOV      CX,7
MOV      AH,4EH
INT     21H
MOV      DI,CUR_FILE
CALL     BUFFER_NAME

RENAME_END: CALL     CURSOR_OFF ;Turn cursor back off.
CALL     CLEAR_MSG ;And clear rename message.
RENAME_RET: RET
RENAME_ERROR: CALL     BEEP ;Illegal entry exit.
CALL     CURSOR_OFF
CALL     CLEAR_MSG
RET

;-----
; This subroutine moves the highlighted file to a new directory. ;
;-----
MOVE:      CALL     GET_NAME ;Format the name for DOS.
JC       MOVE_ERROR
MOV      DX,162BH ;Display the move message.
MOV      SI,OFFSET MOVE_MSG
CALL     DISPLAY_TEXT
MOV      SI,OFFSET FILE_NAME
CALL     GET_TEXT
MOV      DX,172BH
CALL     CLEAR_OLD ;Remove previous entry.

NEW_DIR:   CALL     READ_KEY ;Get a keystroke.
CMP      AL,27 ;Is it Esc?
JZ       MOVE_END ;If yes, exit move.
CMP      AL,',' ;Is it "i"?
JZ       NEW_DIR ;If yes, skip.
CMP      AL,13 ;Is it carriage return?
JZ       MOVE_IT ;If yes, move it.
JZ       MOVE_IT ;If it backspace?

```

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PRODUCTIVITY

```

NOT_BS2: JNZ NOT_BS2
CALL MOVE_BS
JMP SHORT NEW_DIR
CMP AL,32
JZ NEW_DIR
CMP DI,0AAH
JZ NEW_DIR
STOSB
CALL WRITE_TEXT
JMP SHORT NEW_DIR

MOVE_IT: CMP BYTE PTR DS:[80H],32
JZ MOVE_ERROR
MOV SI,OFFSET FILE_NAME
MOV AL,' '
CMP DS:[DI-1],AL
JZ ADD_FILE_NAME
STOSB
ADD_FILE_NAME: MOVSB
CMP BYTE PTR DS:[SI],0
JNZ ADD_FILE_NAME
CALL RENAME_FILE
JC MOVE_ERROR
CALL REMOVE_FILE
CALL CURSOR_OFF
CALL CLEAR_MSG
RET

MOVE_ERROR: CALL BEEP
CALL CURSOR_OFF
CALL CLEAR_MSG
RET

;-----
; This subroutine toggles the delete confirm and WordStar message on and off. ;
;-----
VERIFY: XOR VERIFY_FLAG,1
MOV DI,OFFSET MENU+(9*22)+16
MOV SI,OFFSET ON
CMP VERIFY_FLAG,1
JZ TOGGLE
MOV SI,OFFSET OFF
JMP SHORT TOGGLE

WORDSTAR: XOR WORDSTAR_BIT,80H
MOV DI,OFFSET MENU+(10*22)+16
MOV SI,OFFSET ON
CMP WORDSTAR_BIT,7FH
JZ TOGGLE
MOV SI,OFFSET OFF

TOGGLE: MOV CX,3
REP MOVSB
CALL REFRESH_MENU
RET

;-----
; These four subroutines control in which column the sorting will start. ;
;-----
SORT_NAME: MOV SORT_OFFSET,0
JMP SHORT SORT_MSG

SORT_EXT: MOV SORT_OFFSET,4
JMP SHORT SORT_MSG

SORT_SIZE: MOV SORT_OFFSET,8
JMP SHORT SORT_MSG

SORT_DATE: MOV SORT_OFFSET,12
SORT_MSG: MOV DX,1633H
MOV SI,OFFSET LOADING+12
CALL DISPLAY_TEXT

;-----
; This subroutine does the actual sorting. ;
;-----
SORT: CMP COUNT,1
JZ SORT_RETURN
MOV DX,END_OFFSET
SUB DX,40
MOV BP,SORT_OFFSET
MOV BX,OFFSET BUFFER
NEXT_PASS: MOV SI,BX
MOV DI,SI
ADD SI,SORT_TABLE[BP]
ADD DI,SI
CMP BP,12
JZ DO_DATE
MOV CX,SORT_TABLE[BP+2]
COMPARE: REPZ CMPSB
JBE END_SORT
SWAP: MOV SI,BX
MOV DI,BX
ADD DI,40
MOV CX,20
NEXT_SWAP: MOV AX,[DI]
MOVSB
MOV [SI-2],AX
LOOP NEXT_SWAP
MOV SORT_FLAG,1
END_SORT: ADD BX,40
CMP BX,DX
JB NEXT_SORT
SUB DX,40
CMP SORT_FLAG,0
JNZ NEXT_PASS
SORT_RETURN: CALL CLEAR_MSG
RET

DO_DATE: MOV CX,2
REPZ CMPSB
JA SWAP
JNZ END_SORT
SUB SI,8
SUB DI,8
MOV CX,5
REPZ CMPSB
JA SWAP
JNZ END_SORT
ADD SI,10
ADD DI,10
CMPSB
JA SWAP
JNZ END_SORT
SUB SI,6
SUB DI,6
MOV CX,5
CMP WORD PTR [SI],3231H

```

```

JZ CK_MERIDIAN
CMP WORD PTR [DI],3231H
JNZ COMPARE
JMP SWAP
CK_MERIDIAN: CMPSW
JNZ END_SORT
MOV CX,3
JMP SHORT COMPARE

;-----
; This subroutine gets the highlighted file and converts it to DOS format. ;
;-----
GET_NAME: MOV SI,CUR_OFFSET
MOV AX,LINE
SUB AX,323
CL,2
MOV SI,AX
ADD SI,AX
MOV CUR_FILE,SI
PUSH SI
DI,OFFSET FILE_NAME
MOV CX,8
CALL STORE_BYTES
INC SI
CMP BYTE PTR DS:[SI],32
JZ END_NAME
MOV AL,'.'
STOSB
CALL STORE_BYTES
MOV BYTE PTR DS:[DI],0
POP SI
CMP BYTE PTR [SI+39],H
JZ NAME_ERROR
JZ CLC
NAME_ERROR: RET

STORE_BYTES: LODSB
CMP AL,32
JZ SKIP_STORE
STOSB
SKIP_STORE: LOOP STORE_BYTES
RET

;-----
; This subroutine moves and turns the cursor on and removes ;
; the last user entry in preparation for new input. ;
;-----
CLEAR_OLD: CALL SET_CURSOR
CALL CURSOR_ON
MOV DI,80H
MOV AX,2B20H
MOV CX,18
REP STOSW
MOV DI,80H
RET

;-----
; This subroutine backspaces. ;
;-----
MOVE_BS: CMP DI,80H
JZ MOVE_BS_END
DEC DI
MOV SI,OFFSET BS
CALL GET_TEXT
MOVE_BS_END: RET

;-----
; This subroutine renames or moves the file. ;
;-----
RENAME_FILE: MOV BYTE PTR DS:[DI],0
MOV DX,OFFSET FILE_NAME
MOV DI,80H
MOV AH,56H
INT 21H
RET

;-----
; This subroutine removes the filename from the directory listing. ;
;-----
REMOVE_FILE: MOV DI,CUR_FILE
MOV SI,DI
ADD SI,40
NEXT_RECORD: MOV CX,20
REP MOVSW
CMP DI,END_OFFSET
JZ NEXT_RECORD
SUB DI,40
MOV END_OFFSET,DI
XOR BP,BP
CALL SCROLL
DEC COUNT
JNZ MORE_FILES
JMP EXIT
MORE_FILES: CMP COUNT,21
JAE REMOVE_END
SUB PAGE_END,160
MOV SI,PAGE_END
SUB SI,160
CMP SI,LINE
JA REMOVE_END
CALL MOVE_BAR
REMOVE_END: CALL FILE_COUNT
RET

;-----
; This subroutine displays the count of files. ;
;-----
FILE_COUNT: MOV DI,OFFSET FILES
MOV AX,2020H
STOSW
MOV AX,COUNT
MOV BL,10
NEXT_COUNT: DIV BL
XCHG AL,AH
ADD AL,'0'
STOSB
XCHG AL,AH
XOR AH,AH
CMP AX,0
JNZ NEXT_COUNT
CLD
MOV DX,188EH
MOV SI,OFFSET FILES
CALL DISPLAY_TEXT
RET

```

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- U16. SOUND A TUNE** that lets you know a stage has been completed in batch processing.
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- U26. BATMAKER.** Creates bat files containing all matching files. This is great when using Find in a text search.
- U27. MENU PROGRAM.** Allows for tailor made menus. Good screen appearance.
- U28. GO TO DIRECTORY** directly on a hard disk. Reduces amount of keyboard work.
- U29. SECONDARY DOS.** Lets you suspend currently executing application and invokes a secondary Dos command processor so new commands can be executed.
- U30. ALLBUT** the programmes you specify can be acted on. Eg. delete, copy, etc.
- U31. MEASURE** the time your computer takes to execute commands.
- U32. DISK ERROR MONITOR.** A resident programme that monitors disk errors and gives more information than the abort/retry/ignore message.
- U33. REMEMBER COMMANDS.** Remembers last 50 commands which may be edited or executed.
- U34. RENAME A DIRECTORY.**
- U35. DISPLAY COMMENTS FROM CONFIG.SYS** file when booting up.
- U36. BUILD DIRECTORY FILE WITH COMMENTS.** Has asm source code so that you can tailor to own needs. Produces list of files with size, crc, file no. and space for comments.

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- U130. PRINT ITALICS.** Set printer for output in italics. Epson compatible.
- U131. PRINTER RESET.** Resets printer to power-up mode.
- U132. GRAPHIC SCREEN DUMP** for Epson compatibles.
- U133. SET 51 LINES PER PAGE** on Epson compatible computer.
- U134. SET 132 COLUMNS PER PAGE** on Epson compatible computer.
- U135. SET UNDERLINE MODE** on Epson compatible printer.
- U136. SET COMPRESSED PRINT** on Epson compatible printer.
- U137. SET ENLARGED PRINT** on Epson compatible printer.
- U138. SET WIDE PRINT** on Epson compatible printer.
- U139. SET EMPHASISED PRINT** on Epson compatible printer.
- U140. SET EXTENDED CHARACTERS** on Epson compatible printer.
- U141. PRINT SPOOLER.** Creates a 16k buffer in memory, which allows you to do other work whilst printing.
- U142. DISK-BASED PRINT SPOOLER.** Uses capacity of disk as buffer for printing, allowing you to continue with other work.
- U143. SEND ESCAPE (ESC) SEQUENCES** as part of command, such as for printing.
- U144. WORD FREQUENCY.** Counts number of times each word is used in a text file.
- U145. FAST WORD COUNT.** Provides count of words, characters, lines, plus a mathematical check sum, which allows you to compare text files for changes.
- U146. APPOINTMENT REMINDER.** Stores data on disk like a daily appointments diary. Prints details of next 7 days.
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- U149. WORD LENGTH ANALYSER.** Checks the length of words in text and compares with readers' level of schooling.
- U150. TEXT CHECKER.** Examines Wordstar files for typing errors such as missing brackets and quotes.
- U151. TEXT FILE SORT.** Fast and works with very large files.
- U152. LIST NON-ASCII BASIC FILE** without loading Basic. Also helpful for listing if you don't have Basic/GWBasic.
- U153. PAUSE LISTING** so that printer will produce 55 lines on a page.

EQUIPMENT HANDLING

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- U407. HARD DISK PERFORMANCE TEST.** Checks the running of hard disks.
- U408. COMPUTER LOG** to keep track of amount of time of computer usage, how time spent.
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- U415. NEW ANSI.SYS** that may aid screen presentation and allow faster execution of many functions.

- U416. BLACK & WHITE MODE** can be switched on colour graphics card.
- U417. TIMEPARK HEAD** of hard disk after a specified time has elapsed.
- U418. SET 40 or 80 screen columns** BW mode on colour systems.
- U419. STATUS REPORT** on system, including information about drives, memory available.
- U420. SPEED TEST (1)** checks processor speed and compares with IBM-PC. Similar to Norton test.
- U421. SPEED TEST (2)** checks computer speed in two areas, including Sieve calculation and track to track access time, and compares with IBM-PC.
- U422. SPEED TEST (3)** comprehensive checks on processing, including block write, register/memory, multiply, divide, stack operations, far jumps, etc. and compares with IBM-PC.
- U423. RAM TEST.** Tests and tests and tests ram. Identifies faulty memory.
- U424. DOS ENVIRONMENT VARIABLE EDITOR.** Make changes to edit path, prompt, etc.
- U425. EXPAND DOS ENVIRONMENT SPACE TO 1K.**
- U426. FLIP ON/OFF (TOGGLE) DOS PARAMETERS.** Works on several standard Dos parameters.
- U427. WHAT PROCESSOR?** Examines and identifies the processor/s being used, such as 8088, 8086, etc.
- U428. WHAT DEVICE DRIVERS?** Examines and reports on devices (eg ports) installed in your computer.
- U429. WHAT DOS CONFIGURATION?** Examines and reports on memory, vector addresses, and statistical information about version of Dos you are using.
- U430. WHAT EQUIPMENT?** Examines your equipment and reports on the installed drives, type of cards (eg, printer, colour, mono, RS232) etc.
- U431. EDIT RAM STORAGE** in your computer.
- U432. DRIVE STATUS.** Reports on no. of bytes, sectors, clusters-what capacity is and how much is free.
- U433. DIAGNOSTICS.** Performs large number of computer diagnostics and reports on serial, parallel ports, video, etc.
- U434. DRIVE TEST.** Floppy disk test drive utility.
- U435. SLOW AMSTRAD 1512** Programs e.g. games that run too fast.

FILE MOVING

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- U512. DELETE ALL BUT** those programs you identify.
- U513. INTELLIGENT COPY PROGRAM** that creates sub-directories as part of the transfer. Also renames rather than over writes.
- U514. SUPERIOR COPY PROGRAM** that checks and evaluates target before copying. Eg, copies last dated version.
- U515. UNIQUE COPY PROGRAM** with same function as f.c but does not copy those already on target disk.
- U516. TREE SURGERY.** Prune files unwanted/ duplicated on hard disk. Has source code and compares files with the same name.
- U517. KILLDIR.** Delete a branch of a directory. Reduces steps and saves time.
- U518. MOVE DIRECTORY** around if you prefer it stored in different location.

FILE ORGANISATION & CHECKING

- U611. BOMB ALERT.** Examines new files for malicious intent and reports on possible danger to other files.
- U612. BASIC MENU GENERATOR.** Better access to your Basic files through a menu. For Basic/GWBasic.
- U613. UNSQUEEZE ARC FILES.** Small, efficient utility that occupies less space and is simpler to use than Arc.Exe.

- U614. HARD DISK OPTIMISER.** Related group of files that optimise hard disk usage and eliminate file fragmentation. Helps pack the disk.
- U615. FILE RE-ORGANISER.** Regroups a fragmented file into contiguous sectors on a disk for more efficient disk access.
- U616. RECOVER BAD SECTORS.** Records data on disk. Does 12 retries and thus may recover bad sectors.
- U617. COLLECT BAD SECTORS.** Marks bad sectors for collection into a separate file that will not be used. Works with floppies and hard disk.
- U618. ADVANCED COMPARE** facility that can save as edit script, generate and update deck.

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- U805. PREPROCESSOR FOR "C" COMPILERS.** Has "C" source and helps organise coding into efficient form for compiling.
- U806. VOICE EMULATION.** Compiled with Basic source module which allows extensions, revision or use as tutorial.
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23	24	25	26	27	28	29	30	31
32	33	34	35	36	130	131	132	133
134	135	136	137	138	139	140	141	142
143	144	145	146	147	148	149	150	151
152	153	406	407	408	409	410	411	412
413	414	415	416	417	418	419	420	421
422	423	424	425	426	427	428	429	430
431	432	433	434	511	512	513	514	515
516	517	518	611	612	613	614	615	616
617	618	805	806	807	808	809	810	811
812	813						435	


```

;-----;
; This subroutine displays the current directory, menu, and number of files. ;
;-----;

```

```

REFRESH_DIR: CALL CLS ;Clear the screen.
REFRESH_MENU: MOV SI,OFFSET MENU ;Point to menu position.
MOV DI,(2*160)+98 ;And to screen position.
MOV BH,19 ;Display 19 lines of menu.
MOV CX,22 ;22 characters per line.
NEXT_REFRESH: MOV LODSB
NEXT_MENU: MOV BL,AL
CALL WRITE_SCREEN
LOOP NEXT_MENU
ADD DI,116 ;Next line.
DEC BH
JNZ NEXT_REFRESH

MOV DX,4
MOV SI,OFFSET DIRECTORY ;Display "Directory ".
CALL DISPLAY_TEXT
MOV SI,OFFSET PURGE_DIR ;Display working directory.
CALL GET_TEXT
CALL FILE_COUNT ;Display file count.
MOV BL,INVERSE ;Put up cursor bar.
CALL BAR
RET

```

```

;-----;
; This subroutine scrolls the screen. ;
;-----;

```

```

SCROLL: MOV SI,CUR_OFFSET ;Get current offset.
ADD SI,BP ;Add requested direction.
CMP SI,OFFSET BUFFER ;If above start check upper limit.
JAE UPPER_LIMIT
MOV CUR_OFFSET,OFFSET BUFFER ;Else, make it start.
JMP SHORT SCROLL_RETURN ;And update screen.

UPPER_LIMIT: MOV BX,END_OFFSET ;See if beyond end of
CMP BX,OFFSET BUFFER+21*40 ;directory listing as well.
JA CX_UPPER
MOV CUR_OFFSET,OFFSET BUFFER
JMP SHORT SCROLL_RETURN

CX_UPPER: SUB BX,21*40
CMP SI,BX
JBE END_SCROLL
MOV SI,BX

END_SCROLL: MOV CUR_OFFSET,SI ;Update current offset.
SCROLL_RETURN: RET

```

```

;-----;
; This subroutine scrolls the bar if between start ;
; and end of page. Otherwise the page is scrolled. ;
;-----;

```

```

SCROLL_BAR: MOV SI,LINE ;Get current line.
ADD SI,BP ;Add requested line.
MOV BP,-40 ;Assume below beginning.
CMP SI,323 ;Is it?
JB SCROLL_PAGE ;If yes, scroll page instead.
MOV BP,40 ;Do the same for end of page.
CMP SI,PAGE_END
JAE SCROLL_PAGE
CALL MOVE_BAR
RET

SCROLL_PAGE: CALL SCROLL
RET

```

```

;-----;
; This subroutine does the actual moving of the bar. ;
;-----;

```

```

MOVE_BAR: MOV BL,NORMAL ;Remove old bar.
CALL BAR
MOV LINE,SI ;And move bar to new line.
MOV BL,BAR_ATTRIBUTE
CALL BAR
RET

BAR: MOV DI,LINE ;Retrieve line.
MOV CX,39 ;Bar length 39.
NEXT_BAR: CALL WRITE_SCREEN ;Write the attribute.
LOOP NEXT_BAR
RET

```

```

;-----;
; This subroutine displays the directory listing. ;
;-----;

```

```

UPDATE_SCREEN: XOR BP,BP
MOV SI,CUR_OFFSET ;Retrieve starting offset.
MOV DI,2*160+2 ;Point to row two of screen.
MOV BH,21 ;21 lines to write.
MOV CX,40 ;40 characters per line.
NEXT_WRITE: MOV LODSB ;Get a byte.
NEXT_CHAR: MOV BL,AL ;Save it in BL.
CALL WRITE_SCREEN ;Write them.
LOOP NEXT_CHAR
ADD DI,80 ;Bump pointer to next line.
DEC BH ;Do all 21 lines.
JNZ NEXT_WRITE
RET

```

```

;-----;
; This subroutine displays the directory by writing directly ;
; to the screen buffer. To avoid screen noise (snow) on the ;
; color card, the horizontal retrace has to be monitored. ;
;-----;

```

```

WRITE_SCREEN: MOV DX,STATUS_REG ;Retrieve status register.
MOV AX,VIDEO_SEG ;Point to screen segment.
MOV ES,AX

HORIZ_RET: IN AL,DX ;Get status.
TEST AL,1 ;Is it low?
JNZ HORIZ_RET ;If not, wait until it is.
CLI ;No more interrupts.

WAIT: IN AL,DX ;Get status.
TEST AL,1 ;Is it high?
JZ WAIT ;If no, wait until it is.
MOV AL,BL ;Retrieve character; now it's OK
STOSB ;to write to screen buffer.
INC DI ;Interrupts back on.
PUSH CS ;Bump pointer past attribute.
POP ES
RET ;Return

```

```

;-----;
; These two subroutines clear either the messages or the entire screen. ;
;-----;

```

```

CLEAR_MSG: MOV CX,162BH ;Row 22; column 43.
MOV DX,174FH ;Row 23; column 79.
JMP SHORT CLEAR_WINDOW

CLS: XOR CX,CX
MOV DX,184FH ;Entire screen.
BP
PUSH BP
PUSH BX
MOV BH,NORMAL ;Clear with original attribute.
MOV AX,600H
INT 10H
POP BX
POP BP
RET

```

```

;-----;
; These subroutines display the messages. ;
;-----;

```

```

DISPLAY_TEXT: CALL SET_CURSOR ;Move cursor.
GET_TEXT: MOV AL,0 ;Zero marks end of string.
CMP AL,0
JZ END_TEXT
CALL WRITE_TEXT
JMP SHORT GET_TEXT

END_TEXT: RET

WRITE_TEXT: PUSH SI ;BIOS does not save SI.
MOV AH,0EH ;Write teletype.
INT 10H
POP SI
RET

```

```

;-----;
; These four subroutines move the cursor, get the current ;
; directory, beep the speaker or get a keystroke. ;
;-----;

```

```

SET_CURSOR: PUSH SI
XOR BH,BH ;Page zero.
MOV AH,2 ;Set cursor.
INT 10H
POP SI
RET

GET_DIR: MOV BYTE PTR [SI],'\ ' ;DOS doesn't preface directory
INC SI ;with slash so we must.
XOR DL,DL
MOV AH,47H ;Retrieve default directory.
INT 21H
RET

BEEP: MOV DL,7 ;Beep via DOS.
MOV AH,2
INT 21H
RET

READ_KEY: MOV AH,0 ;Retrieve keystroke via BIOS.
INT 16H
RET

```

```

;-----;
; These subroutines turn the cursor off and on. ;
;-----;

```

```

CURSOR_OFF: MOV CX,2000H
JMP SHORT SET_TYPE

CURSOR_ON: MOV CX,CURSOR_TYPE

SET_TYPE: MOV AH,1
INT 10H
RET

```

```

;-----;
; This long subroutine stores the filename in DIR ;
; format. That is, filename, bytes, date and time. ;
;-----;

```

```

BUFFER_NAME: MOV SI,150 ;Point to filename.
MOV CX,12 ;Store 12 bytes of filename.
NEXT_STORE: MOV LODSB ;Get a byte.
CMP AL,0 ;End of filename?
JZ END_STORE ;If yes, finish with blanks.
CMP AL,'.' ;Is it the period?
JNE STORE_BYTE ;If no, store.
SUB CX,3 ;Else store 3 spaces.

MOV AL,32
REP STOSB
ADD CX,3
JMP SHORT NEXT_STORE ;Get next byte.

STORE_BYTE: STOSB ;Store byte.
END_STORE: LOOP NEXT_STORE ;Get next byte.
REP STOSB ;Pad balance with spaces.

FILE_SIZE: PUSH DI ;Save pointer.
ADD DI,8 ;Move to end of bytes field.
MOV DX,DS:[154] ;Retrieve high and low words
MOV AX,DS:[156] ;of bytes.
MOV BX,10 ;Convert to decimal; divide by 10.
STD ;Reverse direction.

NEXT_SIZE: MOV CX,DX ;Low word in CX.
XOR DX,DX ;Zero in high half.
DIV BX ;Convert to decimal.
XCHG AX,CX ;Retrieve low word.
DIV BX
XCHG AX,DX ;Retrieve remainder.
ADD AL,'0' ;Convert to ASCII.
STOSB ;Store it.
OR CX,DX ;Are we done?
JNZ NEXT_SIZE ;If no, divide again.
POP DI ;Back to forward direction.
ADD DI,11 ;Retrieve pointer.
MOV DX,DS:[152] ;Move to date field.
MOV AX,DX ;Retrieve date.
MOV CL,5 ;Shift to lowest bits.
ROR AX,CL
AND AX,0FFH ;Mask off all but month.
MOV CH,0FFH ;Flag as no leading zeros.
MOV CH,'-' ;Delimiting character.
CALL STORE_WORD ;Store it.

MOV AX,DX ;Retrieve date.
AND AX,1FH ;Mask off all but day.
MOV CL,0 ;Flag include leading zeros.

```

C CODE FOR THE PC

source code, of course

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```

MOV     CH, '-'
CALL    STORE_WORD          ;Store it.

MOV     AX, DX
MOV     CL, 9
ROR     AX, CL
AND     AX, 7FH
ADD     AX, 80
CMP     AX, 100
JB      DISPLAY_DATE
SUB     AX, 100
MOV     CL, 0
MOV     CH, 32
CALL    STORE_WORD          ;Store it.

TIME:   INC     DI            ;Move to time field.
        MOV     DX, DS:[150] ;Retrieve time.
        MOV     AX, DX
        MOV     CL, 11
ROR     AX, CL
AND     AX, 1FH
PUSH    AX
CMP     AX, 12
JBE     MERIDIAN
SUB     AX, 12
CMP     AX, 0
JNE     NOT_MIDNIGHT
MOV     AX, 12
NOT_MIDNIGHT: MOV     CL, 0FFH
        MOV     CH, '-'
        CALL    STORE_WORD          ;Store it.

        MOV     AX, DX
        MOV     CL, 5
ROR     AX, CL
AND     AX, 3FH
MOV     CL, 0
POP     DX
MOV     CH, 'p'

```

```

CMP     DX, 12              ;Is it PM?
JAE     PM
MOV     CH, 'a'             ;If no, AM.

PM:     CALL    STORE_WORD          ;Store it.
        MOV     AL, 'H'
        TEST    BYTE PTR DS:[149], 6
        JZ      NOT_HIDDEN
        STOSB
        RET
NOT_HIDDEN: INC     DI
        RET

;-----;
STORE_WORD: DIV     BL
        ADD     AX, '90'
        CMP     CL, 0
        JZ      STORE_IT
        CMP     AL, '0'
        JNZ     STORE_IT
        MOV     STOSW
        MOV     AL, CH
        STOSB
        RET

;-----;
; Approximate 700 filename buffer at end of code.
;-----;

CURRENT_DIR DB      0
PURGE_DIR   EQU     CURRENT_DIR+68
FILR_NAME   EQU     PURGE_DIR+66
BUFFER      EQU     FILE_NAME+13

CODE ENDS
END START

```

(Figure 1 ends)

```

100 REM -- BASIC PROGRAM TO CREATE DR.COM
110 OPEN "DR.COM" AS #1 LEN = 1
120 FIELD #1,1 AS A#
130 CHECKSUM = 0
140 FOR I = 1 TO 422
150     LINESUM = 0
160     FOR J = 1 TO 8
170         READ BYTE
180         CHECKSUM = CHECKSUM + BYTE
190         LINESUM = LINESUM + BYTE
200         IF (BYTE < 256) THEN LSET A# = CHR$(BYTE)
210     NEXT J
220     NEXT I
230 READ LINECHECK
240 IF LINECHECK <> LINESUM THEN PRINT "Error in Line";280 + 10 * I
250 NEXT I
260 CLOSE
270 IF CHECKSUM = 34107H THEN PRINT "Successful Completion!" : END
280 PRINT "COM file is not valid!" : END

290 DATA 233, 41, 3, 0, 0, 0, 0, 176, 453
300 DATA 7, 112, 112, 0, 0, 0, 0, 0, 231
310 DATA 0, 12, 0, 9, 0, 3, 0, 13, 37
320 DATA 0, 8, 0, 29, 0, 0, 189, 14, 239
330 DATA 0, 0, 0, 0, 0, 0, 99, 14, 113
340 DATA 1, 0, 67, 1, 42, 46, 42, 0, 199
350 DATA 1, 127, 0, 0, 1, 17, 18, 19, 183
360 DATA 20, 28, 31, 32, 47, 49, 50, 59, 316
370 DATA 60, 61, 62, 63, 64, 65, 66, 67, 508
380 DATA 68, 71, 72, 73, 79, 80, 81, 118, 642
390 DATA 132, 105, 5, 51, 10, 89, 10, 48, 450
400 DATA 9, 105, 10, 173, 6, 97, 10, 225, 635
410 DATA 8, 173, 6, 81, 10, 169, 9, 173, 629
420 DATA 6, 225, 6, 48, 9, 169, 9, 28, 502
430 DATA 10, 51, 10, 81, 10, 89, 10, 97, 358
440 DATA 10, 105, 10, 32, 6, 4, 6, 16, 189
450 DATA 6, 45, 6, 4, 6, 24, 6, 63, 165
460 DATA 6, 38, 6, 2, 6, 104, 7, 159, 330
470 DATA 7, 9, 8, 132, 7, 207, 7, 9, 386
480 DATA 8, 2, 8, 0, 0, 0, 0, 0, 18
490 DATA 0, 0, 0, 78, 111, 116, 32, 101, 438
500 DATA 110, 111, 117, 103, 104, 32, 109, 101, 787
510 DATA 109, 111, 114, 121, 36, 73, 110, 118, 792
520 DATA 97, 108, 105, 100, 32, 100, 105, 114, 761
530 DATA 101, 99, 116, 111, 114, 121, 36, 84, 782
540 DATA 111, 111, 32, 109, 97, 110, 121, 32, 723
550 DATA 102, 105, 108, 101, 115, 36, 76, 111, 754
560 DATA 97, 100, 105, 110, 103, 32, 97, 110, 754
570 DATA 100, 32, 83, 111, 114, 116, 105, 110, 771
580 DATA 103, 32, 100, 105, 114, 101, 99, 116, 770
590 DATA 111, 114, 121, 46, 0, 76, 111, 97, 676
600 DATA 100, 105, 110, 103, 32, 100, 105, 114, 769
610 DATA 101, 99, 116, 111, 114, 121, 46, 0, 708
620 DATA 68, 105, 114, 101, 99, 116, 111, 114, 828
630 DATA 121, 32, 111, 102, 32, 0, 32, 32, 462
640 DATA 32, 32, 70, 105, 108, 101, 115, 0, 563
650 DATA 32, 119, 105, 108, 108, 32, 98, 101, 703
660 DATA 32, 100, 101, 108, 101, 116, 101, 100, 759
670 DATA 46, 0, 68, 111, 32, 121, 111, 117, 606
680 DATA 32, 119, 105, 115, 104, 32, 116, 111, 734
690 DATA 32, 100, 101, 108, 101, 116, 101, 32, 691
700 DATA 105, 116, 63, 32, 32, 89, 47, 78, 562
710 DATA 0, 69, 110, 116, 101, 114, 32, 110, 652
720 DATA 101, 119, 32, 110, 97, 109, 101, 32, 701
730 DATA 102, 111, 114, 32, 0, 69, 110, 116, 654
740 DATA 101, 114, 32, 110, 119, 32, 100, 709
750 DATA 105, 114, 101, 99, 116, 111, 114, 121, 881
760 DATA 32, 102, 111, 114, 32, 0, 32, 79, 502
770 DATA 78, 0, 79, 70, 0, 8, 32, 337
780 DATA 8, 0, 201, 205, 205, 205, 205, 205, 1234
790 DATA 205, 205, 205, 205, 205, 205, 205, 1640
800 DATA 205, 205, 205, 205, 205, 205, 187, 1622
810 DATA 186, 32, 32, 32, 32, 32, 32, 410
820 DATA 68, 32, 46, 67, 79, 77, 32, 32, 483
830 DATA 32, 32, 32, 32, 32, 186, 186, 32, 564

```

```

840 DATA 40, 67, 41, 32, 67, 111, 112, 121, 591
850 DATA 114, 105, 103, 104, 116, 32, 49, 57, 680
860 DATA 56, 55, 32, 186, 186, 32, 77, 105, 729
870 DATA 99, 104, 97, 101, 108, 32, 74, 46, 661
880 DATA 32, 77, 101, 102, 102, 111, 114, 100, 739
890 DATA 32, 186, 199, 196, 196, 196, 196, 196, 1397
900 DATA 196, 196, 196, 196, 196, 196, 196, 1568
910 DATA 196, 196, 196, 196, 196, 196, 182, 1554
920 DATA 186, 32, 70, 49, 32, 32, 86, 519
930 DATA 105, 101, 119, 32, 40, 111, 114, 32, 654
940 DATA 17, 196, 217, 41, 32, 186, 186, 32, 907
950 DATA 70, 50, 32, 32, 32, 68, 101, 108, 493
960 DATA 101, 116, 101, 32, 32, 32, 32, 478
970 DATA 32, 32, 32, 186, 186, 32, 70, 51, 621
980 DATA 32, 32, 32, 82, 101, 110, 97, 109, 595
990 DATA 101, 32, 32, 32, 32, 32, 32, 32, 325
1000 DATA 32, 186, 186, 32, 70, 52, 32, 32, 622
1010 DATA 32, 77, 111, 118, 101, 32, 32, 32, 535
1020 DATA 32, 72, 32, 32, 32, 32, 32, 186, 410
1030 DATA 186, 32, 70, 53, 32, 32, 32, 67, 504
1040 DATA 111, 110, 102, 105, 114, 109, 32, 32, 715
1050 DATA 32, 79, 78, 32, 32, 186, 186, 32, 657
1060 DATA 70, 54, 32, 32, 32, 87, 111, 114, 532
1070 DATA 100, 83, 116, 97, 114, 32, 32, 79, 653
1080 DATA 78, 32, 32, 186, 186, 32, 70, 59, 671
1090 DATA 32, 32, 32, 83, 111, 114, 116, 32, 552
1100 DATA 98, 121, 32, 78, 97, 109, 101, 32, 668
1110 DATA 32, 186, 186, 32, 70, 56, 32, 32, 626
1120 DATA 32, 83, 111, 114, 116, 32, 98, 121, 707
1130 DATA 32, 69, 120, 116, 46, 32, 32, 186, 633
1140 DATA 186, 32, 70, 57, 32, 32, 32, 83, 524
1150 DATA 111, 114, 116, 32, 98, 121, 32, 83, 707
1160 DATA 105, 122, 101, 32, 32, 186, 186, 32, 796
1170 DATA 70, 49, 48, 32, 32, 83, 111, 114, 539
1180 DATA 116, 32, 98, 121, 32, 100, 97, 84, 680
1190 DATA 101, 32, 32, 186, 186, 32, 69, 115, 753

1200 DATA 99, 32, 32, 116, 111, 32, 69, 120, 611
1210 DATA 105, 116, 32, 32, 32, 32, 32, 32, 413
1220 DATA 32, 186, 200, 205, 205, 205, 205, 205, 1443
1230 DATA 205, 205, 205, 205, 205, 205, 205, 1640
1240 DATA 205, 205, 205, 205, 205, 205, 205, 1623
1250 DATA 32, 32, 85, 115, 101, 58, 32, 24, 479
1260 DATA 32, 25, 32, 80, 103, 95, 112, 32, 501
1270 DATA 80, 103, 68, 110, 32, 32, 32, 94, 551
1280 DATA 80, 103, 85, 112, 32, 94, 80, 103, 689
1290 DATA 68, 110, 32, 72, 111, 109, 101, 32, 635
1300 DATA 69, 110, 100, 32, 184, 1, 51, 179, 725
1310 DATA 0, 205, 33, 252, 180, 25, 205, 33, 933
1320 DATA 162, 3, 1, 184, 64, 0, 142, 216, 772
1330 DATA 161, 99, 0, 5, 5, 0, 14, 31, 316
1340 DATA 163, 4, 1, 61, 186, 3, 116, 27, 561
1350 DATA 199, 6, 6, 1, 0, 184, 50, 255, 701
1360 DATA 180, 8, 205, 16, 136, 38, 8, 1, 592
1370 DATA 128, 244, 119, 136, 38, 9, 1, 136, 811
1380 DATA 38, 10, 1, 50, 255, 180, 3, 205, 742
1390 DATA 16, 137, 14, 11, 1, 131, 252, 253, 815
1400 DATA 186, 163, 1, 119, 3, 233, 227, 0, 932
1410 DATA 128, 62, 128, 0, 0, 117, 3, 233, 671
1420 DATA 137, 0, 190, 129, 0, 172, 60, 13, 701
1430 DATA 116, 50, 60, 47, 117, 247, 172, 36, 845
1440 DATA 95, 60, 69, 117, 6, 199, 6, 13, 565
1450 DATA 1, 4, 0, 60, 83, 117, 6, 199, 470
1460 DATA 6, 13, 1, 8, 0, 60, 68, 116, 272
1470 DATA 4, 60, 84, 117, 6, 199, 6, 13, 489
1480 DATA 1, 12, 0, 60, 79, 117, 6, 199, 472
1490 DATA 6, 29, 1, 190, 129, 0, 172, 60, 528
1500 DATA 60, 13, 116, 71, 60, 47, 116, 67, 550
1510 DATA 60, 32, 118, 243, 86, 172, 60, 32, 803
1520 DATA 118, 23, 60, 47, 116, 19, 60, 58, 501
1530 DATA 117, 243, 138, 84, 254, 128, 226, 95, 1285
1540 DATA 128, 234, 65, 180, 14, 205, 33, 235, 1094
1550 DATA 228, 198, 68, 255, 0, 138, 92, 254, 1233

```

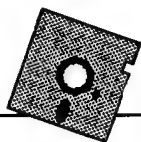
Fig 2 A Basic program that will automatically create DR.COM

Desktop Publishing on the PC

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•CHIWRITER. A multi-font word processor supporting up to 10 fonts and 250 super/subscript levels per line. It is true 'what you see is what you get' and is extremely easy to use. It works with a variety of printers and can produce both fast draft and final, publishing standard high resolution printing. Comes with the operating manual **MASTERING CHIWRITER**

•BUSINESS FORMS. A significant amount of desktop publishing activities in business centre around designing forms for office use - invoices, stock sheets, order forms and so on. The manual **CREATING BUSINESS FORMS** tells you how to get underway immediately, generating master forms tailored to your individual needs. The program **FORMS** allows you to create or revise a master form or a filled-out form. Master and completed forms can be stored on disk as well as printed. Once a master form has been created and saved, it can be recalled an unlimited number of times to be filled out, and then stored - if needed - as a completed form.



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- The program **CHIWRITER**, along with the operating manual **MASTERING CHIWRITER**

- The program **FORMS**, together with its operating manual **CREATING BUSINESS FORMS**

- The **two-disk** on-screen art drawing program **PC-KEY DRAW**

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1620 DATA 1, 186, 31, 12, 232, 211, 7, 191, 871
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1640 DATA 143, 171, 186, 44, 1, 185, 7, 0, 837
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1660 DATA 14, 189, 55, 126, 232, 246, 7, 180, 1049
1670 DATA 79, 205, 33, 114, 48, 255, 6, 40, 780
1680 DATA 1, 232, 233, 7, 59, 253, 118, 239, 1142
1690 DATA 186, 199, 1, 180, 9, 205, 33, 235, 1048
1700 DATA 11, 232, 131, 7, 51, 210, 232, 166, 1040
1710 DATA 7, 232, 200, 7, 186, 41, 14, 180, 867
1720 DATA 59, 205, 33, 138, 22, 3, 1, 180, 641
1730 DATA 14, 205, 33, 205, 32, 137, 62, 34, 722
1740 DATA 1, 131, 199, 40, 137, 62, 36, 1, 607

1750 DATA 139, 30, 40, 1, 131, 251, 21, 115, 728
1760 DATA 17, 129, 6, 36, 1, 32, 3, 184, 408
1770 DATA 160, 0, 246, 227, 5, 67, 1, 163, 869
1780 DATA 38, 1, 128, 62, 29, 1, 1, 116, 376
1790 DATA 3, 232, 196, 4, 191, 109, 14, 180, 929
1800 DATA 25, 205, 33, 4, 65, 170, 58, 736
1810 DATA 170, 139, 247, 232, 90, 7, 232, 56, 1173
1820 DATA 6, 232, 225, 6, 232, 99, 7, 139, 946
1830 DATA 216, 128, 252, 1, 118, 23, 128, 252, 1118
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1910 DATA 189, 184, 252, 232, 34, 6, 235, 39, 1171
1920 DATA 189, 72, 3, 232, 26, 6, 235, 6, 749
1930 DATA 199, 6, 30, 1, 188, 14, 190, 67, 695
1940 DATA 1, 232, 97, 6, 195, 139, 30, 34, 734
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1960 DATA 14, 118, 4, 137, 30, 30, 1, 139, 473
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2020 DATA 198, 40, 59, 247, 118, 248, 56, 28, 994
2030 DATA 116, 13, 131, 198, 40, 66, 128, 60, 752
2040 DATA 32, 117, 243, 232, 173, 6, 195, 139, 1137
2050 DATA 14, 40, 1, 43, 202, 137, 14, 50, 501
2060 DATA 1, 138, 14, 8, 1, 136, 14, 10, 322
2070 DATA 1, 232, 153, 255, 235, 3, 232, 107, 1218
2080 DATA 253, 255, 14, 50, 1, 117, 247, 139, 1077

2090 DATA 14, 9, 1, 136, 14, 10, 1, 51, 236
2100 DATA 237, 232, 195, 5, 195, 232, 106, 6, 1204
2110 DATA 186, 175, 14, 184, 0, 61, 205, 35, 858
2120 DATA 163, 159, 1, 232, 209, 1, 199, 6, 970
2130 DATA 161, 1, 255, 190, 139, 46, 1, 829
2140 DATA 198, 6, 156, 1, 0, 232, 31, 6, 630
2150 DATA 139, 54, 161, 1, 138, 62, 156, 1, 712
2160 DATA 128, 255, 0, 116, 12, 198, 6, 153, 870
2170 DATA 1, 0, 232, 61, 1, 254, 207, 117, 873
2180 DATA 249, 183, 25, 51, 255, 198, 6, 153, 1122
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2200 DATA 249, 232, 54, 6, 128, 252, 1, 116, 1038
2210 DATA 84, 128, 252, 28, 116, 79, 128, 252, 1067
2220 DATA 59, 116, 74, 128, 252, 32, 116, 5, 782
2230 DATA 128, 252, 60, 117, 6, 232, 73, 0, 868
2240 DATA 233, 198, 1, 128, 252, 19, 116, 5, 952
2250 DATA 128, 252, 61, 117, 6, 232, 57, 0, 853
2260 DATA 233, 5, 2, 128, 252, 50, 116, 5, 791
2270 DATA 128, 252, 62, 117, 6, 232, 41, 0, 838
2280 DATA 233, 110, 2, 191, 73, 1, 138, 196, 944
2290 DATA 185, 8, 0, 242, 174, 117, 178, 191, 1095

2300 DATA 152, 1, 209, 225, 43, 249, 255, 21, 1156
2310 DATA 114, 167, 233, 123, 255, 139, 30, 159, 1220
2320 DATA 1, 180, 62, 205, 33, 232, 161, 4, 878
2330 DATA 195, 232, 241, 255, 232, 70, 5, 195, 1425
2340 DATA 128, 62, 156, 1, 0, 117, 15, 59, 538
2350 DATA 46, 36, 1, 249, 116, 13, 232, 38, 731
2360 DATA 0, 198, 6, 156, 1, 23, 254, 14, 654
2370 DATA 156, 1, 248, 195, 232, 137, 0, 115, 1084
2380 DATA 1, 195, 128, 62, 156, 1, 24, 114, 681
2390 DATA 8, 232, 59, 0, 198, 6, 156, 1, 660
2400 DATA 255, 254, 6, 156, 1, 248, 195, 59, 1174
2410 DATA 46, 36, 1, 117, 15, 128, 62, 156, 561
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2430 DATA 1, 0, 235, 25, 139, 54, 161, 1, 616
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2450 DATA 115, 5, 232, 220, 0, 235, 237, 77, 1121
2460 DATA 77, 137, 54, 161, 1, 248, 195, 129, 1002
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2490 DATA 232, 63, 0, 254, 207, 117, 249, 232, 1354
2500 DATA 38, 0, 114, 20, 139, 22, 161, 1, 495
2510 DATA 137, 54, 161, 1, 139, 198, 43, 194, 927
2520 DATA 69, 69, 62, 137, 70, 0, 248, 195, 850
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2600 DATA 0, 93, 89, 91, 172, 34, 6, 49, 536
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2620 DATA 21, 60, 10, 116, 216, 81, 185, 1, 690
2630 DATA 0, 232, 30, 0, 89, 226, 206, 128, 911
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2650 DATA 129, 225, 7, 0, 65, 81, 232, 7, 746
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2670 DATA 176, 32, 128, 52, 155, 1, 1, 617, 672
2680 DATA 7, 138, 216, 52, 77, 4, 226, 251, 1151
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2700 DATA 201, 186, 0, 64, 232, 43, 0, 190, 914
2710 DATA 255, 190, 191, 255, 126, 232, 4, 0, 1293
2720 DATA 185, 253, 253, 247, 218, 232, 26, 0, 1418
2730 DATA 195, 129, 6, 161, 1, 0, 64, 185, 741
2740 DATA 255, 253, 186, 0, 128, 232, 10, 0, 1066

2750 DATA 190, 253, 126, 191, 255, 190, 232, 11, 1450
2760 DATA 0, 195, 139, 30, 159, 1, 184, 1, 709
2770 DATA 46, 205, 33, 189, 139, 218, 185, 0, 1037
2780 DATA 32, 243, 165, 139, 30, 159, 1, 185, 954
2790 DATA 0, 64, 180, 63, 205, 33, 139, 242, 926
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2810 DATA 195, 232, 54, 2, 114, 67, 128, 62, 854
2820 DATA 48, 1, 0, 116, 44, 190, 175, 14, 588
2830 DATA 186, 45, 22, 232, 12, 4, 190, 32, 723
2840 DATA 2, 232, 9, 4, 186, 45, 23, 232, 733

2850 DATA 0, 4, 232, 45, 4, 128, 252, 49, 714
2860 DATA 118, 27, 128, 252, 4, 116, 22, 128, 790
2870 DATA 252, 21, 116, 5, 232, 20, 4, 235, 885
2880 DATA 233, 186, 175, 14, 180, 65, 205, 33, 1091
2890 DATA 114, 7, 232, 105, 2, 232, 191, 3, 886
2900 DATA 195, 232, 253, 3, 232, 184, 3, 195, 1299
2910 DATA 232, 231, 1, 114, 106, 186, 44, 22, 936
2920 DATA 190, 81, 2, 232, 196, 3, 190, 175, 1069
2930 DATA 14, 232, 193, 3, 186, 44, 23, 232, 927
2940 DATA 19, 2, 232, 229, 3, 60, 27, 116, 688
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2960 DATA 241, 60, 92, 116, 237, 60, 63, 116, 985
2970 DATA 233, 60, 42, 116, 229, 60, 13, 116, 867
2980 DATA 25, 60, 8, 117, 5, 232, 2, 2, 451
2990 DATA 235, 216, 60, 32, 114, 212, 129, 255, 1253
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3010 DATA 235, 200, 232, 251, 1, 114, 24, 186, 1243
3020 DATA 128, 0, 185, 7, 0, 180, 78, 205, 783
3030 DATA 33, 139, 62, 32, 1, 232, 173, 3, 675
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3110 DATA 116, 25, 60, 8, 117, 5, 232, 153, 716
3120 DATA 1, 235, 232, 60, 32, 114, 228, 129, 1031
3130 DATA 255, 164, 0, 116, 222, 170, 232, 39, 1198
3140 DATA 13, 235, 216, 128, 62, 128, 0, 32, 804
3150 DATA 116, 32, 190, 175, 14, 176, 92, 58, 964
3160 DATA 69, 253, 116, 1, 170, 16, 128, 60, 963
3170 DATA 0, 117, 250, 232, 122, 1, 114, 10, 846
3180 DATA 232, 131, 1, 232, 41, 3, 232, 214, 1086
3190 DATA 2, 195, 232, 22, 3, 232, 31, 3, 720
3200 DATA 232, 204, 2, 195, 128, 54, 48, 1, 864
3210 DATA 1, 191, 96, 3, 190, 126, 2, 128, 737
3220 DATA 62, 48, 1, 116, 26, 190, 130, 374
3230 DATA 2, 235, 21, 128, 54, 49, 1, 128, 618
3240 DATA 191, 118, 3, 190, 126, 2, 128, 62, 820
3250 DATA 49, 1, 127, 116, 3, 190, 130, 2, 618
3260 DATA 185, 3, 0, 243, 164, 232, 180, 1, 1008
3270 DATA 195, 199, 6, 13, 1, 0, 0, 235, 649
3280 DATA 22, 199, 6, 13, 1, 4, 0, 235, 480
3290 DATA 14, 199, 6, 13, 1, 8, 0, 235, 476
3300 DATA 6, 199, 6, 13, 1, 12, 0, 186, 423
3310 DATA 51, 22, 190, 226, 1, 232, 138, 2, 862
3320 DATA 131, 62, 40, 1, 116, 85, 139, 575
3330 DATA 22, 34, 1, 131, 234, 40, 139, 46, 647
3340 DATA 13, 1, 198, 6, 29, 1, 0, 187, 435
3350 DATA 188, 139, 243, 62, 3, 182, 15, 564
3360 DATA 1, 139, 254, 131, 199, 40, 131, 253, 1148
3370 DATA 12, 116, 53, 62, 139, 142, 17, 1, 542
3380 DATA 243, 166, 118, 23, 139, 243, 139, 251, 1322
3390 DATA 131, 199, 40, 185, 20, 0, 139, 5, 719

3400 DATA 165, 137, 68, 254, 226, 248, 198, 6, 1302
3410 DATA 29, 1, 1, 131, 195, 40, 59, 218, 674
3420 DATA 114, 200, 131, 234, 40, 128, 62, 29, 938
3430 DATA 1, 0, 117, 182, 232, 16, 2, 195, 745
3440 DATA 189, 2, 0, 243, 186, 119, 205, 117, 1037
3450 DATA 226, 131, 258, 8, 131, 229, 8, 185, 1166
3460 DATA 5, 0, 243, 166, 119, 190, 117, 211, 1051
3470 DATA 131, 198, 10, 131, 199, 10, 166, 119, 964
3480 DATA 179, 117, 200, 131, 238, 6, 131, 239, 1241
3490 DATA 6, 185, 5, 0, 129, 60, 49, 50, 484
3500 DATA 116, 8, 129, 61, 49, 50, 117, 152, 682
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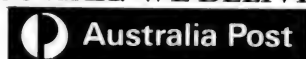


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3530 DATA	1,	45,	67,	1,	177,	2,	211,	232,	736
3540 DATA	3,	240,	137,	54,	32,	1,	86,	191,	744
3550 DATA	175,	14,	185,	8,	0,	232,	28,	0,	642
3560 DATA	70,	129,	60,	32,	116,	9,	176,	46,	637
3570 DATA	170,	185,	3,	0,	232,	13,	0,	198,	801
3580 DATA	5,	0,	94,	128,	124,	39,	72,	249,	711
3590 DATA	116,	1,	248,	195,	172,	60,	32,	116,	940
3600 DATA	1,	170,	226,	248,	195,	232,	183,	1,	1256
3610 DATA	232,	217,	1,	191,	128,	0,	184,	32,	985
3620 DATA	32,	185,	18,	0,	243,	171,	191,	128,	968
3630 DATA	0,	195,	129,	255,	128,	0,	116,	7,	630
3640 DATA	79,	190,	134,	2,	232,	134,	1,	195,	767
3650 DATA	198,	5,	0,	186,	175,	14,	191,	128,	897
3660 DATA	0,	180,	86,	205,	33,	195,	139,	62,	900
3670 DATA	32,	1,	139,	247,	131,	198,	40,	185,	973
3680 DATA	20,	0,	243,	165,	59,	62,	34,	1,	584
3690 DATA	114,	245,	131,	239,	40,	137,	62,	34,	1002
3700 DATA	1,	51,	237,	232,	138,	0,	255,	14,	928
3710 DATA	40,	1,	117,	3,	233,	178,	249,	131,	952
3720 DATA	62,	40,	1,	21,	115,	23,	129,	46,	437
3730 DATA	38,	1,	160,	0,	139,	54,	38,	1,	431
3740 DATA	129,	238,	160,	0,	59,	54,	42,	1,	683
3750 DATA	119,	3,	232,	184,	0,	232,	1,	0,	771
3760 DATA	195,	191,	22,	2,	184,	32,	32,	174,	829
3770 DATA	161,	40,	1,	179,	10,	253,	246,	243,	1133
3780 DATA	134,	196,	4,	48,	170,	134,	196,	50,	932
3790 DATA	228,	61,	0,	0,	117,	240,	232,	186,	1084
3800 DATA	14,	24,	190,	22,	2,	232,	2,	1,	487
3810 DATA	195,	232,	235,	0,	190,	138,	2,	191,	1183
3820 DATA	162,	1,	183,	19,	185,	22,	0,	172,	744
3830 DATA	138,	216,	232,	182,	0,	226,	248,	131,	1373
3840 DATA	199,	116,	254,	207,	117,	238,	186,	4,	1321
3850 DATA	0,	190,	8,	2,	232,	219,	0,	190,	841
3860 DATA	109,	14,	232,	216,	0,	232,	169,	255,	1227
3870 DATA	138,	30,	9,	1,	232,	105,	0,	195,	710
3880 DATA	139,	54,	30,	1,	3,	245,	129,	254,	855
3890 DATA	188,	14,	115,	8,	199,	6,	30,	1,	561
3900 DATA	188,	14,	235,	32,	139,	30,	34,	1,	673
3910 DATA	129,	251,	4,	18,	119,	8,	199,	6,	734
3920 DATA	30,	1,	188,	14,	235,	14,	129,	235,	846
3930 DATA	72,	3,	59,	243,	118,	2,	139,	243,	879
3940 DATA	137,	54,	30,	1,	195,	139,	54,	42,	652
3950 DATA	1,	3,	245,	189,	216,	255,	129,	254,	1292
3960 DATA	67,	1,	114,	13,	189,	40,	0,	59,	483
3970 DATA	54,	38,	1,	115,	4,	232,	5,	0,	449
3980 DATA	195,	232,	172,	255,	195,	138,	30,	8,	1225
3990 DATA	1,	232,	12,	0,	137,	54,	42,	1,	479
4000 DATA	138,	30,	10,	1,	232,	1,	0,	195,	607
4010 DATA	139,	62,	42,	1,	185,	39,	0,	232,	700
4020 DATA	33,	0,	226,	251,	195,	51,	237,	139,	1132
4030 DATA	54,	30,	1,	191,	68,	1,	183,	21,	547
4040 DATA	185,	40,	0,	172,	138,	216,	232,	10,	993
4050 DATA	0,	226,	248,	131,	199,	80,	254,	207,	1345
4060 DATA	117,	238,	195,	139,	22,	4,	1,	161,	877
4070 DATA	6,	1,	142,	192,	236,	168,	1,	117,	863
4080 DATA	251,	250,	236,	168,	1,	116,	251,	138,	1411
4090 DATA	195,	170,	251,	71,	14,	7,	195,	185,	1088
4100 DATA	43,	22,	186,	79,	23,	235,	5,	31,	644
4110 DATA	201,	186,	79,	24,	85,	83,	138,	62,	858
4120 DATA	8,	1,	184,	0,	6,	203,	16,	91,	511
4130 DATA	93,	195,	232,	18,	0,	172,	60,	0,	770
4140 DATA	116,	5,	232,	3,	0,	235,	246,	195,	1032
4150 DATA	86,	180,	14,	205,	16,	94,	195,	86,	876
4160 DATA	50,	255,	180,	2,	205,	16,	94,	195,	997
4170 DATA	198,	4,	92,	70,	50,	210,	180,	71,	875
4180 DATA	205,	33,	195,	1/8,	7,	180,	2,	205,	1005
4190 DATA	33,	195,	180,	0,	205,	22,	195,	185,	1015
4200 DATA	0,	32,	235,	4,	139,	14,	11,	1,	436
4210 DATA	180,	1,	205,	16,	195,	190,	158,	0,	945
4220 DATA	185,	12,	0,	172,	60,	0,	116,	19,	564
4230 DATA	60,	46,	117,	12,	131,	233,	3,	176,	778
4240 DATA	32,	243,	170,	131,	193,	3,	235,	235,	1242
4250 DATA	170,	226,	232,	176,	32,	243,	170,	87,	1336
4260 DATA	131,	199,	9,	139,	22,	154,	0,	161,	814
4270 DATA	156,	0,	187,	10,	0,	253,	139,	202,	947
4280 DATA	51,	210,	247,	243,	145,	247,	243,	146,	1332
4290 DATA	4,	48,	170,	139,	193,	11,	202,	117,	884
4300 DATA	237,	252,	95,	131,	199,	11,	139,	22,	1096
4310 DATA	152,	0,	139,	194,	177,	5,	211,	200,	1078
4320 DATA	37,	15,	0,	177,	255,	181,	45,	232,	942
4330 DATA	114,	0,	139,	194,	37,	31,	0,	177,	692
4340 DATA	0,	181,	45,	232,	102,	0,	139,	194,	893
4350 DATA	177,	9,	211,	200,	37,	127,	0,	5,	766
4360 DATA	80,	0,	61,	100,	0,	114,	3,	45,	403
4370 DATA	100,	0,	177,	0,	181,	32,	232,	75,	797
4380 DATA	0,	71,	139,	22,	150,	0,	139,	194,	713
4390 DATA	177,	11,	211,	200,	37,	31,	0,	80,	747
4400 DATA	61,	12,	0,	118,	3,	45,	12,	0,	251
4410 DATA	61,	0,	0,	117,	3,	184,	12,	0,	377
4420 DATA	177,	255,	181,	58,	232,	37,	0,	139,	1079
4430 DATA	194,	177,	5,	211,	200,	37,	63,	0,	887
4440 DATA	177,	0,	90,	181,	112,	131,	250,	12,	953
4450 DATA	115,	2,	181,	97,	232,	13,	0,	176,	816
4460 DATA	72,	246,	6,	149,	0,	6,	116,	2,	597
4470 DATA	170,	195,	71,	195,	246,	243,	5,	48,	1173
4480 DATA	48,	129,	249,	0,	116,	6,	60,	48,	655
4490 DATA	117,	2,	176,	32,	171,	138,	197,	170,	1003
4500 DATA	195,	0,	0,	0,	0,	0,	0,	0,	193

80-column screen. DR isn't sophisticated enough to implement word wrap, nor can it guess the default margins of your word processor. Standard ASCII text files with margins of 80 columns or less will look just as you'd expect, but text files from word processors that either omit carriage returns for repaging purposes or format the text within specified margins will not display in the same format in which they were created. A word processor's page formatting control codes will appear as gibberish, of course, but this should present no major problem. The text will still be quite readable. If you choose to view an executable file, however, unless there are some embedded text strings such as a copyright notice or message strings, it all will be gibberish. You might find it interesting to look for all the command strings in COMMAND.COM.

If you use DR to list the root directory of your boot disk, you will find the two DOS system files, IBMBIO.COM and IBMDOS.COM, included in the list, although they are omitted by the DOS DIR command. DR lists any hidden or system files that it finds. To distinguish these from normal files, DR places an 'H' immediately after the 'a' or 'p' in the file creation date. If you have protected software installed on your system, you

probably will find a protection scheme filename in the listing you never have seen before. These files will also be marked with the 'H'. You can safely F1 (View) these hidden files, but if you try to delete, rename, or move them, the DR's only response will be a beep.

While debugging DR, I discovered an interesting thing about the DOS function 56H (rename or move a file). I wanted to see what would happen if I renamed IBMBIO.COM to TEST and then, after renaming some other test files, renamed TEST back to IBMBIO.COM. It seemed to work fine, but the next time I booted I got the awful DOS message, 'Non-system disk or disk error'. This meant that one of the three system files, IBMDOS.COM, IBMBIO.COM, or COMMAND.COM, was not found. After booting from a floppy, I discovered (with a little peeking around with DEBUG in the root directory sector of my hard disk) that IBMDOS.COM was no longer the first directory entry — which is where it belongs.

The renaming or moving process does nothing to the actual data, but it does use a new slot in the directory for the new name. You would think that DOS would use the same entry position in the directory when you rename a file, and would just write the new

name right over the old name. Not so. Instead, DOS first enters the new name for the file in its next available directory space. Then DOS deletes the old name by placing the 5EH as the first character of the filename. Operation of your system and/or protected software is not only sensitive to the filename, but also to the logical location in the directory as well as its physical location (its track and sector). Therefore, for your protection, DR refuses to operate on these special files.

I should explain why the 'bytes free' that complements 'file(s)' with the DOS DIR command was not included in DR. There is, after all, a simple DOS interrupt function that returns this information. But DR was designed with speed in mind. Most of this speed can be attributed to DR writing directly to the screen buffer. The DOS interrupt for retrieving disk free space (function 36H) is atrociously slow. To see what I mean, at the DOS prompt enter DIR and watch how long it takes for DOS to display 'bytes free' after it whips out the file count at the end of the listing, and you'll see why the disk free space did not make it past the wish list.

Inside DR

Most of the DR code is a potpourri of

DR at a glance

DR.COM provides an integrated set of file management facilities for sorting, viewing, renaming, deleting, and moving files to another directory. The command is entered at the DOS prompt, with the following syntax:

DR [d:] [directory]

The default filename display (21 per page, to a maximum of 721) is sorted alphabetically. Various switches, added to the command, may be added to sort by other criteria:

/E (sort by Extension)
/S (sort by Size)
/D or /T (sort by DaTe)
/O (sort by DOS DIR order)

Thus, for example,

DR \PROG /S

sorts the initial display of the PROG

directory of the default drive by size.

When a DR listing is on-screen, a menu is displayed showing further options. A highlight bar illuminates a single filename, and the Up and Down Arrow keys move the bar a line at a time. The PgUp and PgDn keys move it a page at a time, and Ctrl-PgUp and Ctrl-PgDn move it to the top and bottom of the current page. Home and End move to the beginning and end of the directory listing. Pressing (and repeating) a letter moves the bar to the first (and successive) filename(s) beginning with that letter.

The highlighted file may be brought on-screen for viewing by pressing F1 (or Enter or Ctrl-V). The Up and Down Arrows, PgUp and PgDn, and Home and End work within the file, as well. Esc, Enter, or F1 returns you to the menu and directory listing. At the

menu level, Esc terminates the program.

Within DR, these function keys or Ctrl-letter combinations are

F1.....	Ctrl-V (or Enter)	View file
F2.....	Ctrl-D	Delete file
F3.....	Ctrl-R	Rename file
F4.....	Ctrl-M	Move file
F5.....	(none)	CONFIRM DELETE ON/OFF
F6.....	Ctrl-W	WordStar hi-bit ON/OFF
F7.....	Ctrl-N	Sort files by Name
F8.....	Ctrl-E	Sort files by Extension
F9.....	Ctrl-S	Sort files by Size
F10....	Ctrl-T	Sort files by Date

Successive sorts can be used to arrange files, eg, in order of size and then, additionally, by extension.

Files can be renamed and may be moved from one directory to another within DR, but they cannot be copied from within DR.

somewhat modified routines I've used in other programs. The viewing function, however, presented a new, challenging subroutine. Instead of rehashing the old routines, therefore, I'll focus the discussion on DR's algorithm to display files. Creating the algorithm is an easy task as long as the user is restricted to paging through the document in a forward direction. All the algorithm has to do is to keep a lookout for either carriage returns or linefeeds.

If backward paging is to be added, the simplest indexing algorithm is to count backward 25 linefeeds to find the previous page. (When I speak of 'page' here I mean the 25 lines displayed on the standard monitor, not the 66 lines of a type-written page.) This doesn't work so well if the line is longer than 80 columns or if carriage return/linefeed combinations are missing, as they are in the document files of many word processors, eg XyWrite. In such cases a paragraph will be strung out all on one line to the right and off the screen. And, of course, executable files will have linefeeds only by coincidence. If line wrap is employed to keep the text from exceeding the 80-column margins of the screen, then counting linefeeds can no longer be used as an indexing method to find the previous page.

I wanted DR to display the text in the 80-column format, so I added the criterion that line wrap would occur under two conditions: one, if a carriage return were encountered, or two, if

column 80 were encountered before a carriage return. If column 80 is reached before a carriage return, in order to keep the text in an 80-column format, DR starts the next display on the following line. This is line wrap and should not be confused with word wrap.

The 80-column format complicates matters, however. If the user enters a request to scroll back a page, DR cannot just count backward 25 linefeeds, but instead the total number of characters displayed on the screen must be counted backwards. Another problem arises in how to handle the Up and Down Arrows, requesting to move one line at a time. Let's take paging backward (moving backward 25 lines at a time) first and then I'll explain scrolling backward (moving backward a line at a time).

It may seem as simple as storing the current offset into the file buffer for each page of the file. This works fine for small files, files under the 32k buffer DR maintains at any one time for display. When a file is first opened for viewing, 16k is read into the second half of the buffer. (DR assumes that the user will find what he wants with quick peeks at the first page or so. In order to keep disk access time to a minimum, DR reads only 16k at a time.)

When page forwarding reaches the end of the first 16k of the file, this block is moved to the first half of the buffer and the next 16k is read into the second half of the buffer. We now have 32k bytes of the file buffered, with the current offset in the middle.

Subsequent paging, forward as well as backward, will not require (for a while) another time-consuming disk read.

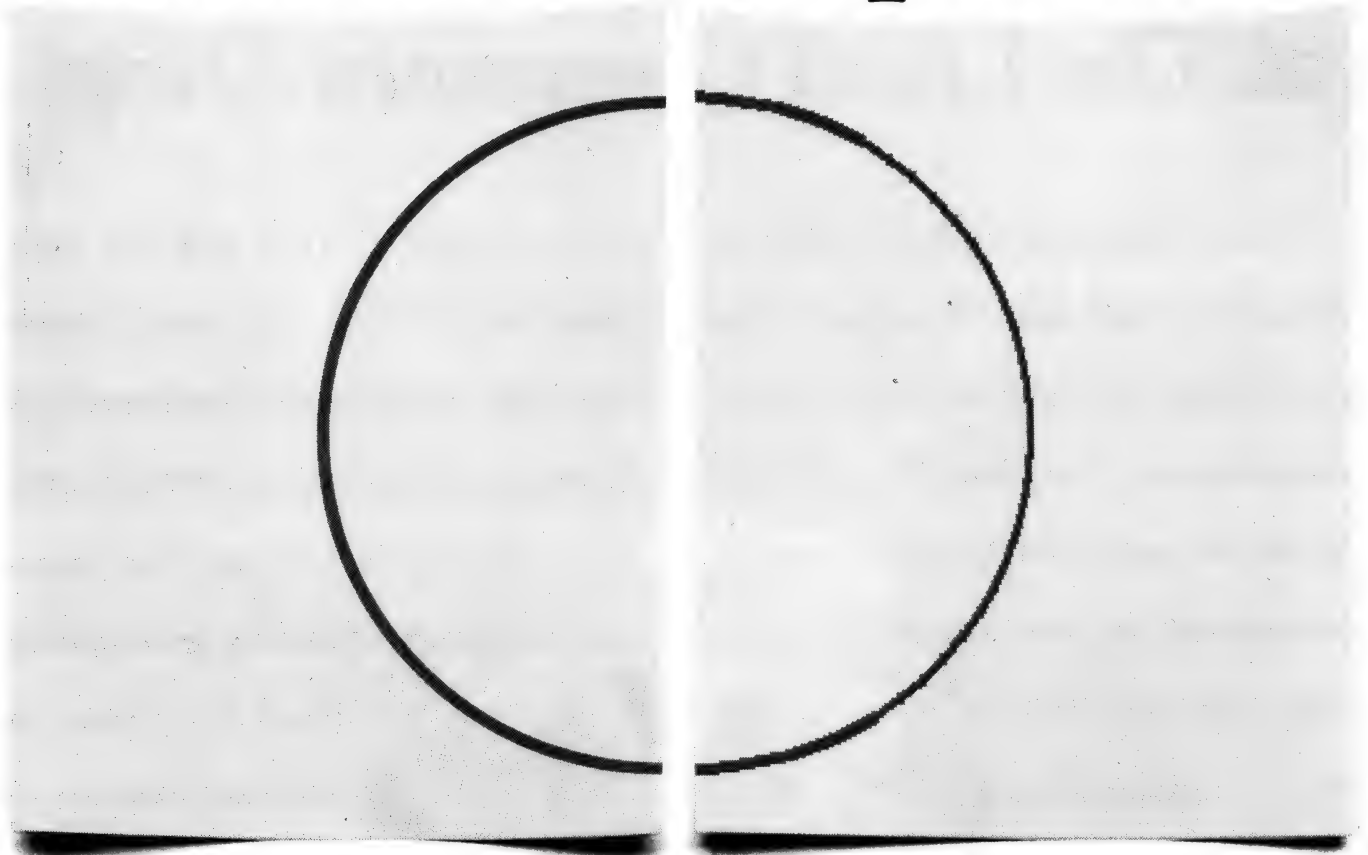
Relative offsets

This shuffling of the data in the buffer has changed the address of the current offset in the buffer by 16k. Not only will the current offset be off, but all the other offsets saved with paging will also be off by 16k. In order to solve this problem, DR does not save the absolute offset of the page. Instead, it stores the relative difference between pages. This is the number of bytes it took to display one screen. In this way, all DR has to do is keep track of the current offset of the last page. You will find this variable defined as LAST_PAGE in the assembly listing. If the second half of the buffer is moved into the first half, the absolute address is adjusted by 16k and, since all the other pages are relative addresses, they are essentially adjusted as well. These page lengths are stored in a single dimensional array variable called PAGES. You can think of this as the same as the Basic variable index function used with the dimension (DIM) statement. Thus the length of page 1 is stored in PAGE(1) and page 2 in PAGE(2), etc. With each succeeding PgUp, the current offset is adjusted by this length of page and stored as the new current offset.

Line scrolling

Now we come to the question of scroll-

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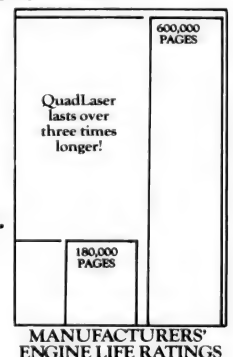
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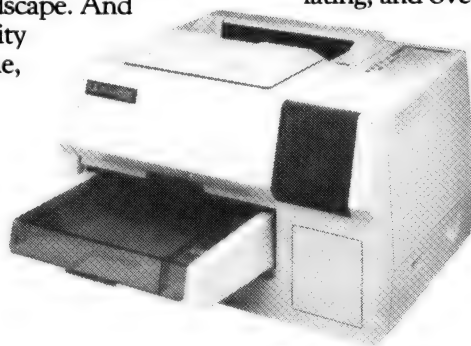
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PRODUCTIVITY

64k Memory Map of DR

Starting offset

Hex Decimal

0	0	Program segment prefix (PSP) reserved by DOS
80h	128	Command line parameters. The disk transfer address (DTA).
100h	256	Single and defined variables followed by the code.
D4Dh	3405	Undefined string variables Current directory 68 bytes Requested directory 66 bytes Highlighted filename 13 bytes
DD8h	3544	Start of directory listing Maximum of 721 filename records of 40 bytes each . . .
7E9Bh	32411	Page length 50 pages minimum (100 bytes) Expands downward toward directory listing
7EFFh	32511	File buffer First half 16k
BEFFh	48895	Second half 16k (The first read is to the second half)
FEFFh	65279	Stack 256 bytes

ing one line at a time, that is, the use of the Up and Down Arrows. Once the relative start of every page is known, scrolling by lines is easy. The row can be thought of as the second dimension of the starting offset. DR stores a variable called ROW, the current row of the current page. ROW starts out with a value of 0 pointing to row 1 of the page. (Indexing is easier when it starts at 0, as you'll see in a moment.)

Before displaying a page, DR takes the current offset, the start of the current page, and calls on the line display formatting routines (LINES) that searches for carriage returns or column 80, ROW number of times. This is the same routine that is used to display the text, so while DR finds the starting offset of the current page, a DISPLAY FLAG is set to zero so that DR will skip writing to the screen buffer. Since ROW is initialised to zero, pointing to the first row, DR calls on the line subroutine zero times, that is, skips it entirely. Then the same line formatting routine is called upon again 25 times, this time with the DISPLAY_FLAG set to 1, to display a single page of text.

When Down Arrow is pressed, the ROW is incremented and DR calls on

the LINES routine one time before displaying the text. ROW is incremented with each press of the Down Arrow. When ROW is 24 and you press the Down Arrow, indicating a request to start the display from line 26 (remember, we start the count from 0, meaning line 1), ROW is reset to zero and the page is incremented by 1 by calling on the PgDn subroutine. Just the opposite is done when Up Arrow is pressed. ROW is decremented by 1 until it reaches 0. The next scroll up request sets ROW to 24 and the page is decremented by 1.

To use the Basic DIMension notation, then, the appropriate starting display offset would be OFFSET (PAGE,ROW).

If the beginning of the buffer is reached while paging up, DR moves the current 16k (the first half of the buffer) into the last half of the buffer and then reads in the previous 16k of the file into the first half of the buffer. And most importantly, the current offset of the file is adjusted by adding 16k to the variable LAST_PAGE. This again places the current offset in the middle of the buffer, always giving DR plenty of elbow room to scroll forward or backward.

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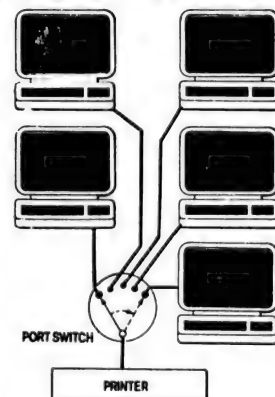
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Type right

DR handles one special situation that the DOS TYPE command does not. If a text file is exactly 80 columns wide, followed by a carriage return/linefeed, the TYPE command, after displaying the 80 columns of text, will wrap to the next line. The first character encountered on line 2 is the carriage return, so TYPE moves down one more line. This has the effect of double-spacing a single-spaced 80-column document. DR, after displaying column 80, checks to see if the next character is a carriage return. If so, the file pointer is bumped past it, avoiding the annoying double-spacing.

DR insists on having all 64k of the space allotted to a .COM file and, if not found, it exits with a 'Not enough memory' message. The unknown string variables, current directory, request directory, and highlighted filename are all stored at the end of DR's 3370 bytes of code. This is followed by the directory listing, page lengths, and file buffer.

Excluding these variables as

reserved, defined bytes excludes those lengthy bytes of zeros from appearing in the .COM file on disk and, most importantly, the Basic listing (Fig 2).

The file buffer has an absolute starting address 32k below the 256 bytes reserved by DR from the stack, as

'There's a constant battle between making utilities powerful and keeping their code short.'

shown in the table, '64k Memory Map of DR'.

The space between the string space at the end of code and the file buffer at the end of the segment is dynamically allocated for the filenames and page lengths. Just below the file buffer, DR reserves a minimum of 50 words as the storage location for the page lengths.

The space between the last string variable at the end of code and the 50-

word storage for pages is used for filenames. This is room enough for 721 filenames, more than enough room for most subdirectories. If, however, you hit this barrier, DR will exit with a 'Too many files' message.

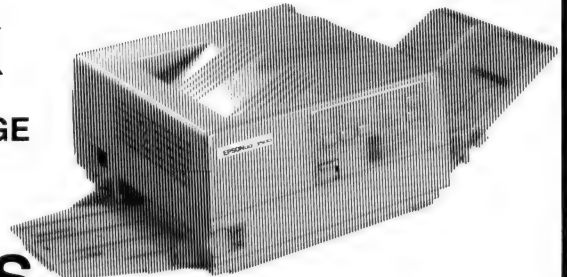
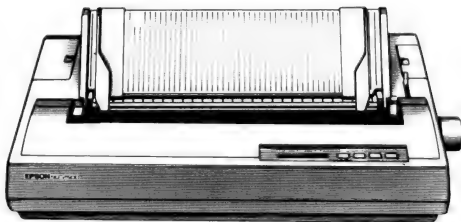
If the list of filenames is less than the 721 allocated, as will be the case with most directories, DR allocates the space from the last directory entry storage to the file buffer for the page variables, greatly increasing the number of displayable pages. This dynamic memory allocation gives DR the flexibility to meet most directory doctoring needs.

There's a constant battle between making the utilities for this column powerful and keeping their code length short, and this time the can-you-add-one-more-neat-function side won. If you enter these programs at your keyboard rather than download them from Microtex, I fear you'll find this one a brute. But, considering the time-saving power you're getting, I think you'll agree the work is worth the effort.

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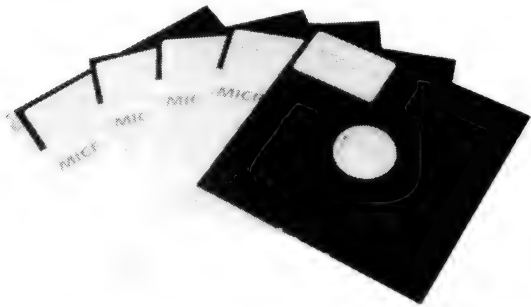
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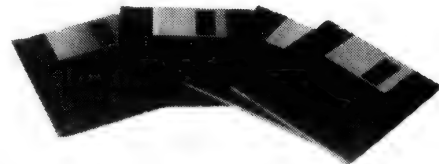
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What every desktop publisher should know

Desktop publishing has become the fashionable 'buzzword' in computing circles, but some fundamental printing and design conventions need to be mastered before the software can be used proficiently. Henry Budgett explains the jargon.

In a world where, far from becoming 'paperless', our output of printed material is doubling at an alarming rate, it is hardly surprising that any attempt to increase our efficient use of paper is rapidly accepted. Just two years ago desktop publishing (DTP) was unheard of, but today we are as familiar with the term as with the spreadsheet, the word processor or the database. Sadly, we are not as familiar with its correct use.

The publishing process is not a single act as with word processing, but a long and complex undertaking. That is not to say that someone who is using word processing or a similar application will not be able to make the best of a desktop publishing package, but rather to point out that new skills will need to be learned and new concepts understood.

It is essential to realise at the outset that desktop publishing software is totally unlike any other; by itself it doesn't produce anything. It most closely resembles an infinite supply of blank sheets of paper onto which items may be attached in order to create a page, which may contain text or graphics or both. The arrangement of the text can be altered at will — as can its position

— without ever having to reach for scissors or glue. DTP acts as an integrator of the output from other office automation packages. The user creates the pages by manipulating this information so as to make it pleasing to the eye, informative, amusing, or whatever effect is required.

Conventions

The need to understand design is often heavily stressed during conversations

'Desktop publishing is one of the most seductive 'toys' that can currently be found on any computer system'.

or articles on DTP. A rather more realistic approach would be to point out that there are certain conventions which have been imposed by traditional working methods. The freedom gained by using electronic means to create the page has already changed

those working methods and is, itself, leading to new conventions.

Desktop publishing is one of the most seductive 'toys' that can currently be found on any computer system. The sheer freedom to play around with typefaces, styles and sizes — a process impossible with conventional word processing — tends to mean that users will try all the possible combinations. While this may be 'wrong' according to the traditional school, it costs nothing apart from time — and quickly reveals what does and doesn't work in terms of presentation.

The most fundamental realisation that needs to be made is that desktop publishing uses 'real' typefaces which are proportionally spaced and not the monospaced characters of the word processing world. Because of this you will need to develop the idea of working within a 'grid'. The grid is really a set of guides which help you to produce a consistent document, and in traditional printing would consist of sheets of heavy paper pre-printed with a pattern of blue lines. (Blue doesn't reproduce when photographed for printing.) Following traditional methods, the typeset text would then be pasted down within this framework and



Illustration by Kate Simpson

photographs and illustrations added as required. The whole sheet would then be photographed at actual size and the resulting image used to make a plate. This latter stage, the photography and platemaking, still forms a part of DTP where large numbers of copies are required.

Designing a grid for the pages you wish to produce is really a matter of common sense. With the A4 page, say, the number of options is rather restricted; one column of text is too wide to read comfortably, while four columns are often too narrow. The user's choice, therefore, rests with two or three.

Other elements of the grid — spaces for photographs and illustrations, page numbers and other items that will appear on each page — can also be added at this stage. Creating grids with desktop publishing software is a matter of moments with most of the good packages and, once created, they can be used over and over again without ever needing to be redrawn.

Choosing the typeface and style for the document is the next biggest hurdle. Because of the flexibility in DTP many users tend to over-experiment with the design of their pages, and documents can easily resemble Victorian handbills in design: there seems to be an almost universal delight in trying out all the fonts on one page! Once again, it is only the traditional approach which says that this is actually wrong. Usually the choice of typeface and style is simple to make: pick one that looks good to your eye.

A good rule of thumb is to restrict your early use of type to one or two typefaces in the document in no more than three sizes. With a word processor you might get bold and underlined with, perhaps, italics. Apart from the variations in pitch, the other typographic controls available are limited in the extreme. Now you have entered the world of desktop publishing, there are many controls to consider and many more traps for the unwary.

Design

In general terms it is best, but not essential, to choose one typeface for the main text and a different one for headings. Traditionally, and with good reason, large amounts of text are set in a serifed face (that's the one with the little tick marks at the ends of the letters) and headings are set in a typeface that doesn't have them: a sans serif face. (APC doesn't follow this convention, so reinforcing my

point that one doesn't have to conform.)

The two other main decisions that have to be made at the design stage are the sizes of type and the style in which it is to be set. The size of the type and the amount of spacing between lines, the leading, are very much more controllable within desktop publishing than word processing. Typesizes are measured in points; one-point is 1/72nd of an inch, and can normally be controlled in at least one point increments. Just as with word processing, type can be set flush with the left-hand margin, centred or justified. In this latter case it is important to realise that we should expect true hyphenated justification (or H&J as it is commonly known). Words can be split according to a set of pre-defined rules or from a table of correct hyphenations, but in both cases you may wish to ensure that English English is being used rather than American English.

Part of the decision as to whether to justify text or not should rest on the kind of product that is being produced. The human eye and brain are much happier reading short to medium length unjustified lines, although books are conventionally justified. Once again, however, it costs nothing to try an idea out.

All the points raised so far are conceptual rather than practical and would apply to any publication method from handset lead type through to true electronic publishing. Where desktop publishing begins to score, even over its close cousin, corporate electronic publishing (or CEPS), is in its ability to integrate with current personal computer systems. While Apple was the first company to successfully market a desktop publishing system, although Xerox invented it, the business world tends to run on PC-type systems rather than Macintoshes. Early PC-based software was both expensive and fairly awful; Studio Software, which produced the first desktop publishing program for the PC, recently went to the wall as a direct result of being unable to keep up with the new leaders.

Any desktop publishing package worth considering should be able to read files from a wide range of word processors, databases, spreadsheets and graphics packages in their native format. That is to say that a word in bold in your word processor file should still be bold when it gets onto the page, even though it has changed from being a monospaced typeface to a 'real' typeface and may also be in a different typesize. Similarly, graphics files should be able to retain their formats

and display an accurate representation of their content, either when viewed on the screen or printed on the page.

Using graphics in a publication produced by traditional means is straightforward. When the drawing has been created it is measured up, and a reduced or enlarged version is pasted onto the page prior to being photographed for printing. There is absolutely nothing to stop this method being used for desktop publishing, and where the original only exists in printed form it may be the only viable method.

If, however, the lure of creating illustrations by electronic means is strong, then consider the following carefully. Before choosing a painting or drawing package it is important to realise the fundamental difference between them. A painting program creates images as a pattern of dots on the screen and the resolution of that screen determines the resolution at which that image may be printed, irrespective of the resolution of the printing device. An image drawn on, say, a Macintosh screen is stuck forever at 72 dots per inch — whether printed out on a matrix printer or a plotter.

A drawn image, on the other hand, consists of a series of coordinate points and instructions on how to join them up. Because it is the instructions which are stored, and not the pattern of dots, it is possible to reproduce them on any system, at whatever size is required. Patterns of dots from a painting program tend to fall apart when enlarged or coagulated into muddy puddles if reduced. For serious work, stick firmly to drawing or object-orientated programs.

Photographs are widely used in publications but cannot yet be successfully integrated into desktop publishing. That doesn't mean that you can't use photographs, merely that the traditional methods still produce better results than the electronic ones. Scanners convert the image they are given into a pattern of dots, typically at a resolution of 300dpi. If this is printed directly on a page printer at the same resolution the results seem reasonable, but if you attempt to reproduce the image by photocopying or traditional printing the lack of quality becomes all too apparent. A 300dpi scanner can manage to scan in line artwork but, apart from using it as a guide, photographs are best left well alone.

The problem is two-fold. Photographs consist of a continuously varying tone, hence the name 'half-tone' in the printing world. To reproduce them by traditional methods involves using a special



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camera which can reduce the photograph to the required size and, at the same time, convert it into a pattern of dots — a process called 'screening'. What makes this pattern of dots different to those that can be produced by a scanner and page printer is that they vary in size. A basic scanner can capture a dot as either being there or not; it is a binary device. More sophisticated scanners can capture levels of grey as well, but they do require more memory. An A4 page scanned at 300dpi needs just over 1Mbyte of storage; whereas the same page scanned at 16 levels of grey would need 4Mbytes. The base level for anything approaching quality reproduction would be 64 levels, and this needs over 6.5Mbytes.

The problem doesn't end there. The page printer is a binary device: it either prints a dot or it doesn't — and is, therefore, incapable of producing dots of varying sizes. The scanner manufacturers use lots of clever software to simulate halftones by a process called 'dithering'. This uses a varying pattern of dots to create the effect of varying intensities of grey but, at 300dpi, it is a pretty poor attempt. To achieve newspaper quality reproduction — the lowest we tolerate in daily life — would require a 700dpi scanner and a 700dpi page printer — devices that simply do not exist on the desktop publishing scene.

Because photographs and line artwork processed through a scanner are captured as bit-maps, all the earlier comments about painting programs apply equally when it comes to resizing them for inclusion within a page. One very significant product, Adobe Illustrator, looks set to change that for line artwork at least but it will be a year or two yet before scanned photographs become a reality.

Page makeup

Collecting all the raw material to create the final page or document is only the beginning of the desktop publishing process, and is something that would have to have been done whatever system was being used. It is at this point that things start to change and we can add the phrase 'page makeup' to the vocabulary.

When you have completed the design process and selected the details concerning the number of columns, typeface, and so on, you will be ready to load all the prepared information into your chosen page makeup package. The choice of which package to select

SON OF VENTURA?

As soon as you see the display you'll realise that GEM Desktop Publisher bears an uncanny resemblance to Ventura but, given the product's history, that should hardly come as a surprise. The team of programmers who began work for Digital Research on a desktop publishing product split; some going out on their own to form Ventura, the rest remaining to complete the project.

ONCE THE INITIAL FEELING OF *deja vu* has faded away one is left wondering how much or, perhaps, how little of the Ventura power is retained by the GEM product. The answer is, rather like Rolls Royce's description of their engine's horsepower, sufficient for its purpose. It would be wrong to claim that the product contained the considerable functionality of Ventura but neither would it be fair to describe it as just a 'cut-down' imitation.

Market Positioning

Our testing of the product has been restricted by the requirements of a major project that we are currently undertaking but the first impressions are good. To begin with we would take issue with the positioning of the product; on DR's own admission it isn't playing in the same league as products like Ventura, PageMaker or Harvard Professional Publisher. What it offers is a very powerful document formatting capability with restricted typographic controls. This makes it well suited to use in the traditional WP environment as a text processing tool for, say, reports and simple documents. And, as these represent the largest volume of documents produced in the business market, DR should not find much difficulty selling it as that.

HOWEVER, DR want to position it as a desktop publishing product and here it comes up against products such as Mirrorsoft's Fleet Street Publisher for the Atari and, soon, for the PC. These contain the refinements that the GEM product lacks. Office publishing and document formatting are, sadly, phrases that don't roll off the tongue quite as nicely as

desktop publishing but that's the market that'll buy GEM Desktop Publisher. It's quite powerful enough to turn word processed reports into presentable documents

that used by Ventura. GEM DTP saves its pages in a Ventura format so, given a matching style sheet the pages could be read back into Ventura for further



and many of the apparent limitations could well prove to be a bonus for those worried about the issues of controlling enthusiastic new desktop publishers.

Background Details

GEM Desktop Publisher runs, as expected, under the GEM environment and operates as a WYSIWYG program with the same style of operation as Ventura. Text files can be imported with their formats intact from 1st Word Plus, GEM Write, Wordstar, WordPerfect, Multimate and Displaywrite as well as in DCA form or as plain ASCII. One clever feature is that the keyboard can be re-mapped to use command sequences that users are familiar with from their word processor. Graphics files can be imported from anything that produces GEM format .IMG and .GEM files. Don't expect to be able to do much in the way of graphics within the program, though!

Just as with Ventura, GEM Desktop Publisher uses a system of tags to control the format of the document and these can be inserted either into the plain text brought into GEM DTP or incorporated into the original word processed document. Text files can be extracted from GEM DTP pages, a slightly more controlled method of document management than

enhancement.

One serious omission here is that it is not possible to tell what style sheet is currently loaded, nor is any immediate indication provided of the tag attached to a given paragraph. Both these are, in our opinion, omissions which make the product significantly harder to use. The method of copying paragraph tags has also changed, the style attached to the new tag doesn't automatically affect the selected paragraph, it has to be selected. This, actually, is not a bad idea as there has been many an occasion when we have had little accidents with the Ventura approach.

Getting Started

SETTING UP A PAGE USES a method very similar to that found in Ready, Set, Go! or XPress; areas to contain the text are marked out using the Frames tool and then designated as containing one or more columns, the limit is four. Plus points of this method over Ventura are that it's quicker and you have the option of getting an exact read-out of the cursor position so placement can be very accurate without having to resort

This valiant effort at a page layout displays numerous common errors:

- *Headlines should never be justified or hyphenated — if necessary, rewrite the words to fit*
- *Uneven spacing — to give a page a coherent 'feel' make sure that the gaps between paragraphs, or between headings and paragraphs are all the same. In this case the last column has been 'stretched' vertically. Cross headings in larger typefaces should have extra space below them to prevent descenders (letters like 'g' and 'p') from crashing into the following text*
- *Practically every paragraph starts in a different way — indented or not, large capital letter or small caps. Keep to one or two styles and make sure you know why you're using them. Headings should add 'structure' to the page*
- *A single word on a line on its own (for example, the word 'enhancement' under the picture) gets lost. In this case moving the picture up a line or two might have helped; otherwise a quick bit of rewriting could have lengthened the line*
- *When using columns, make sure the lines of text line up across the page. The spacing for headings or pictures needs to be a whole number of lines*
- *If using a bit-image graphic, crop it rather than distort it to fill the shape you want. Enlarging an image too much gives a coarse blocked effect*

is usually helped considerably by a number of factors:

- Firstly, and most important, is the type of product you wish to produce. For example: is it a short document or a long one? Does it include illustrations or photographs? What methods are currently used to produce it?
- Secondly, you must consider the environment within which the work is done. Is it based on PCs or is there a free choice of machines? Will data files come from one program or many and are they the same type.
- Finally, you will need to consider the people who are going to be using the product. Are they writers or designers, or managers?

There are fundamentally two different approaches to creating pages electronically. The first method follows the conventional cut & paste concept with varying degrees of enhancement, while the second removes much of the drudgery and lets the software handle the complicated stuff. It is important to realise early on that the degree to which you can let the computer get on with producing your pages automatically corresponds exactly to the amount of control over those pages that you will be able to exert as a user.

In the good, old-fashioned days, text was sent off to be typeset and came back in long strips called galleys. When they had been proofread and corrected to satisfaction, these galleys were cut up and pasted down onto a master layout sheet using wax or gum. When an illustration or photograph was to be used, the appropriate area was opened up and the relevant item inserted. If text needed to be re-set for any reason, it was back to the typesetter again.

This process has been accepted and developed since the first typesetting systems which produced galleys were introduced. It is interesting to note, therefore, that the best-selling desktop publishing package on the market today, Aldus PageMaker, follows this process exactly.

Text from a word processor file flows onto the page as a galley of typeset material. The typeface, size and style are set before the text begins to flow, as are the margins — but any or all of these can be altered at any stage. This eliminates the traditional need to have things re-set — in PageMaker it's a trivial task, although sometimes a little tedious. PageMaker also keeps track of all the bits of the galley, so if a section is moved or deleted, all the other portions move accordingly. The

SON OF VENTURA?

As soon as you see the display you'll realise that GEM Desktop Publisher bears an uncanny resemblance to Ventura but, given the product's history, that should hardly come as a surprise. The team of programmers who began work for Digital Research on a desktop publishing product split; some going out on their own to form Ventura, the rest remaining to complete the project.

Once the initial feeling of *deja vu* has faded away one is left wondering how much or, perhaps, how little of the Ventura power is retained by the GEM product. The answer is, rather like Rolls Royce's description of their engine's horsepower, sufficient for its purpose. It would be wrong to claim that the product contained the considerable functionality of Ventura but neither would it be fair to describe it as just a 'cut-down' imitation.

Market Positioning

Our testing of the product has been restricted by the requirements of a major project that we are currently undertaking but the first impressions are good. To begin with we would take issue with the positioning of the product; on DR's own admission it isn't playing in the same league as products like Ventura, PageMaker or Harvard Professional Publisher. What it offers is a very powerful document formatting capability with restricted typographic controls. This makes it well suited to use in the traditional WP environment as a text processing tool for, say, reports and simple documents. And, as these represent the largest volume of documents produced in the business market, DR should not find much difficulty selling it as that.

However, DR want to position it as a desktop publishing product and here it comes up against products such as Mirrorsoft's Fleet Street Publisher for the Atari and, soon, for the PC. These contain the refinements that the GEM product lacks. Office publishing and document formatting are, sadly, phrases that don't roll off the tongue quite as nicely as desktop publishing but that's the market that'll buy GEM Desktop Publisher. It's quite powerful enough to turn word processed reports into presentable documents and many of the apparent limitations could well

We take a look at Digital Research's new desktop publishing package for the less typographically demanding.

prove to be a bonus for those worried about the issues of controlling enthusiastic new desktop publishers.

Background Details

GEM Desktop Publisher runs, as expected, under the GEM environment and operates as a WYSIWYG program with the same style of operation as Ventura. Text files can be imported with their formats intact from 1st Word Plus, GEM Write, Wordstar, WordPerfect, Multimate and Displaywrite as well as in DCA form or as plain ASCII. One clever feature is that the keyboard can be re-mapped to use command sequences that users are familiar with from their word processor. Graphics files can be imported from anything that produces GEM format .IMG and .GEM files. Don't expect to be able to do much in the way of graphics within the program, though!

Just as with Ventura, GEM Desktop Publisher uses a system of tags to control the format of the document and these can be inserted either into the plain text brought into GEM DTP or incorporated into the original word processed document. Text files can be extracted from GEM DTP pages, a slightly more controlled method of document management than that used by Ventura. GEM DTP saves its pages in a Ventura format so, given a matching style sheet the pages could be read back into Ventura for further enhancement.

One serious omission here is that it is not possible to tell what style sheet is currently loaded, nor is any immediate indication provided of the tag attached to a given paragraph. Both these are, in our opinion, omissions which make the product significantly harder to use. The method of copying paragraph tags has also changed, the style attached to the new tag doesn't automatically affect the selected paragraph, it has to be selected. This, actually, is not a bad idea as there has been many an occasion when we have had little accidents with the Ventura approach.

Getting Started

Setting up a page uses a method very similar to that found in Ready, Set, Go! or XPress; areas to contain the text



Aldus Manutius, possibly the patron saint of desktop publishers.

are marked out using the Frames tool and then designated as containing one or more columns, the limit is four. Plus points of this method over Ventura are that it's quicker and you have the option of getting an exact read-out of the cursor position so placement can be very accurate without having to resort to typing in numbers. Rulers can be displayed in either inches or millimetres with the option of picas for both. A-series paper sizes are catered for. Interestingly the grid can be set down to 1mm or 1/32" which is better than several packages we could name!

Graphics are placed in much the same way and the text automatically moves out of the way to accommodate them. The runaround is limited to rectangular shapes but at least there's a runaround. Headers and footers can be set up to repeat from page to page but, unlike any other desktop publishing program we've seen they are actually graphics files, not text. This does allow logos and similar images to be merged but seems a strange way of going about it. One good point about all these activities, though, is that they almost all have a keyboard shortcut, so making things much less laborious than they might seem.

Missing Things

What the product lacks, especially compared with Ventura, is true H&J, kerning, automatic paragraph numbering, automatic Table of Contents and Index creation and a couple of other extremely refined functions that have little if any place in the office document market anyway. On the other hand, it gains by being straightforward to use, once the style sheets have been set up, and sufficiently competent to deliver the goods for most users. If someone gets through GEM DTP and then finds they need more, well there's always Ventura and the learning time will have been substantially reduced.

The previous sample page much improved. Cross headings add structure by emphasising different parts of the article. The use of a narrow caption has enabled the graphic to be kept to the correct proportions. And the restrained use of typefaces and styles gives a coherent 'feel'. The cross headings have been spaced so as to clear the following text and to keep the text on a notional 'grid', lining up across the page

benefits of this method are that it can be easily understood and it gives total control over every element at all times.

A variation on this theme is found in packages like Ready, Set, Go! and XPress. Here the galley flows into frames or boxes that have been predefined. This can be much quicker with the text running automatically from page to page, but although the control is there such packages are not so intuitive to use.

For regularly repeated designs it can be very much faster than the 'by hand' approach of PageMaker, but some of the flexibility is lost as a result.

The other main contender is the 'stylesheet' approach as used by Ventura. Here tags are attached to sections of text which are then dropped into a template or pre-defined page layout. The tags can have meaningful

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names like 'Heading' or 'Bullet' which hide a very complex list of typographic controls. These can determine the typeface, size, style, leading, kerning, line-breaks, and so on, completely automatically. This makes Ventura ideal for publishing long, regular-format documents like books or manuals, where the main desire is to keep the style consistent.

The concept tends to fall down slightly when variations are required. It is possible to start off with just one or two tags which control the typographic elements but by the time page numbers, headers, footers, indexes, and so on, have been included the list can get unwieldy. The ideal place to add these tags is when the document is created, otherwise the process becomes even more laborious than with PageMaker. Given a pretagged document and a pre-designed template, however, Ventura can produce pages faster than anything else running on a micro.

Regardless of which product you choose and, if you produce different sorts of document you may well end up with more than one, the important thing is to select the correct tool for the job. In some cases this may even mean not using a page makeup package at all but rather a high-powered word processor like Lotus Manuscript, Word or WordPerfect. It is vital to match the software to the task, not the other way around.

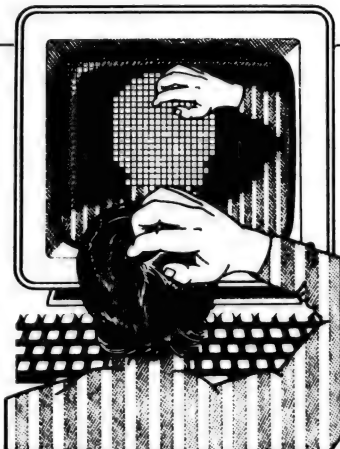
It is also important to realise that the majority of design decisions are simple ones. Indeed, the best designs are usually very simple and elegant rather than cluttered or busy. Remember, above all, that the purpose of the document is that it should convey information easily.

Conclusion

Just as the advent of the word processor allowed people to produce text more efficiently, so will the introduction of desktop publishing allow people to produce documents easily. But, just as with the word processor, the content and presentation of those documents do not necessarily reflect a similar improvement. It is often the case that the quality of the documents produced by someone adopting desktop publishing worsens rather than improves.

If desktop publishing is considered as a tool then it is important, as with any tool, to select that tool correctly and use it sensibly. Most of the techniques are simple, so don't be too ambitious at the start.

END



TJ'S WORKSHOP

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Multi-purpose modem

I recently came across the Commonwealth Bank's Phonebank service, which offers computer simulated voice information over the phone. As I was not disposed to spend \$40 for a hand held Tone-sender, but still desired the free bank data, I decided to explore the possibility of using my modem to emulate the device.

The program in Fig 1 is the result of my labour. The key feature of the program is that it dials the number in pulse mode but switches to tone mode to communicate with the bank's computer. It is recommended that a phone be hooked in parallel to allow the computer voice to be clearly understood, and of course this is essential if you do not have a speaker in your modem. The program uses the standard Hayes AT codes and should be compatible with any modem which emulates these codes.

As you will appreciate this is a poor use for an expensive modem, but for someone with an auto-dial modem who does not have Viatel and Telebank ac-

	C	D	E
3	50	0	+C3/D3
4	25	0	@IF (@ISERR (C4/D4) , 0 , C4/D4)
5			

Fig 2 A formula that turns ERR into 0

cess (at around \$85/year), this is a cheap alternative.

Please excuse the poor program structure, I did not have a manual at hand when I wrote the program, and my Basic is just that.

Ian Brightwell

Getting rid of ERR

In 1-2-3 and in other spreadsheets, when you divide by 0 or try to calculate the square root of a negative number, you will get an ERR display. That can be useful, but it's also unsightly. In Fig 2, I have written a formula that will prevent the ERR display. The formula in E3 calls for division by 0, so it will

display ERR. The formula in E4 actually calls for the same thing but tests for the ERR condition before doing the calculation. Only if the calculation will not result in ERR will it proceed normally and its results be displayed.

J Natividad

ERR, like NA, will spread through a spreadsheet to every cell that references a cell with that condition. Mr Natividad's formula shows how to avoid that problem, since subsequent cells now refer to a legitimate number, 0 — JT.

Managing files

It's easy to use 1-2-3 to manage disk files. Once you read a disk directory into a worksheet, you can use data commands to sort and search for filenames. The macro in Fig 3 does the hard part: reading a directory into 1-2-3 and breaking it into columns of labels and numbers.

The macro is designed to run on a two-floppy system, in which drive B: is the default data drive. (You can easily modify it to run on a system of any configuration.) Put the cursor where you want the list of files to appear, and run the macro. It begins by using the file manipulation commands {open} and {writeln} to write a batch file, EX.BAT, and then uses the /S command to exit

```

5 PRINT "** Connecting to Phonebank **"
6 PRINT " "
10 OPEN "COM1:1200,N,8,1,CS0,DS0,CD0" AS #1
20 PRINT #1,"ATM2DP2614144;"
40 INPUT "Input Account number & Press [ENTER] when asked";A$
41 PRINT #1,"ATDT",A$,";"
42 INPUT "Input Password & Press [ENTER] when asked";B$
43 PRINT #1,"ATDT",B$,";"
50 INPUT "Input Selection [ENTER] when asked";C$
51 IF C$="9" THEN 69
52 PRINT #1,"ATDT",C$,";"
53 GOTO 50
69 PRINT #1,"ATH"
70 CLOSE #1
80 SYSTEM
Ok

```

Fig 1 See 'Multi-purpose modem'


```
{open "A:EX.BAT",w}{quit}
{writeln "dir b: > b:LIST"}
{writeln "EXIT"}
/s
/fit
LIST.~
{down 3}|L>>>>>***L>>***V>>>>***L>>>>>***L>>>>>
~/dpri.
{end}{down}{up}~
o~g
/feoLIST.~y
/fea{esc}A:EX.BAT~y
```

Fig 3 A macro that reads a directory from drive B: into a worksheet and then parses the file as numbers and text

to DOS. At this point, the user must type EX and hit Enter. This then runs the batch file, which redirects the output of a directory of the B: drive to a file on the B: disk called LIST. The file then runs the EXIT command to return to 1-2-3, and the macro continues execution.

It now reads the newly created file, LIST, into the worksheet as text and then uses a format line to confer the resulting column of long tables into several columns of numbers and labels. The last two lines of the macro tidy up by erasing LIST on the disk in B: and EX.BAT on the disk in A:. That happens after LIST has been created, though, so LIST appears as a file within your worksheet. Just delete it.

Now, if you sort alphabetically by filename, you can quickly see which files are duplicates and which are the most recent. If you like, you can sort by file size, date, and time since these are in separate columns, you can quickly delete any information you don't need. You can also add a column to the directory, where you can note which files to erase, move to another disk, etc. If you have many files you need to erase, sort them to the bottom or top of your list and add a column to the left containing the word 'erase' or 'del'. Save this part of the list as a print file, with the extension .BAT. Then,

once you're back in DOS, run the batch file and it will erase all the files at once.

K Kunz

For purposes of explaining how this macro works, giving the newly created disk file the name LIST makes things very clear. However, LIST is a filename you could already have used for something else. You don't want to destroy that LIST when you create a new LIST, so in real life, I'd redirect the DIR results to a file called either DELETE.ME or something wildly implausible.

I like the way this macro exits to DOS for user input and then resumes operation as soon as the batch file returns control to 1-2-3. Short of using a keyboard macro program or wrapping the original loading of 1-2-3 into a batch file, I can't think of a way to make the batch file the macro creates execute automatically without keyboard input. Just think of the fun you could have if you could write a macro that executes batch files at the DOS level — JT.

Beeper

As a compiler of very large programs, I decided to make a change in TURBO.COM to cause a beep every time it finishes compiling. It saves a lot

of time if you can hear exactly when a compilation is complete.

Turbo displays the number of lines compiled when it finishes any compilation. To make it beep, I changed the 's' in 'lines' to a bell character (07H). Fig 4 shows a DEBUG session for implementing the beep in Turbo Pascal, Version 3.01A.

R Milnes

I've been looking for a patch like this for my own long programs. Note that you should be able to use this patch on any version of Turbo Pascal. The 'S' (for 'Search') will find the word 'lines' (in the example Version 3.01A, the offset is 3993). Add 4 to that number to get the offset of the final 's' in 'lines' (in Version 3.01A it's 3997). Of course, you never patch the original of any program. Always make a copy and patch the copy — VR.

Unusual compatch

Turbo Pascal is a terrific program development environment, but, like many others, I've found it frustrating to have to reply 'Y' or 'N' to the 'Include Error Messages' prompt every time. I felt a command line parameter would be more logical, so I came up with a patch to TURBO.COM. This patch allows you to specify the Y/N answer and the name of the work file at the DOS prompt so that you need not waste time typing it once you're inside Turbo.

The DEBUG script file shown in Fig 5 works only with TURBO.COM, Version 3.01A modifications. Unfortunately, I haven't access to other versions so I wouldn't be able to suggest the necessary changes in the script for them.

Carefully type in the script file using your favourite program editor and save it as PATCH.SCR, or just enter the command

COPY CON PATCH.SCR

and carefully type in the file. The extra spaces between some lines are deliberate: be sure you include them. Next, place a copy of TURBO.COM and DEBUG.COM in the same directory as PATCH.SCR and enter

DEBUG <PATCH.SCR

DEBUG will whiz through all of the necessary modifications and return to the DOS prompt. The process leaves the original TURBO.COM untouched and creates the new file, TURBY.COM. This is the patched TURBO.COM.

```
debug turbo.com
-S 100 L 9AF7 "lines"
XXXX:3993
-ECS:3997
XXXX:3997 73.07 <== replace "s" (ASCII 73) with 07H
-w
Writing 9AF7 bytes
-quit
```

Fig 4 The DEBUG procedure for patching Turbo (Version 3.01A) to beep at the end of each compile

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Delete TURBO.COM and rename TURBY.COM to TURBO.COM if you wish.

TURBY.COM will accept Y and N at the DOS prompt as well as the work file name. Observe the following syntax:

TURBY [Y/N] [FILENAME.EXT]

As indicated by the brackets, both the Yes/No reply and the filename are optional, but if you want to specify the filename, you must specify Yes/No first.

The patch attaches itself to the very end of Turbo, at address CS:9BF7h. It makes an intrasegment jump from CS:100 to CS:9C05, the address of the new code. Addresses CS:9BF7 through CS:9C04 are used to store the filename of the work file.

The patched program retrieves the first parameter (if present) from location CS:005D of the PSP, the space reserved for default File Control Block #1. DOS automatically left-justifies and uppercases characters in this space. If a Y or N is found, the response is stored in the keyboard buffer queue, starting at ES:041E. If you enter an invalid response, control transfers to CS:2D7C, where the program normally starts.

The second parameter (if present) is the filename, which is retrieved from location CS:006D of the PSP (reserved for default FCB #2). The program copies this filename to CS:9BF8 and adds the '.' in the proper place. It also adds a 'W' command that selects the 'work file name' function in Turbo and appends a carriage return so that the name is entered automatically. The program then copies the reconstructed name to the keyboard buffer queue.

Once the keyboard buffer is loaded with the correct responses, control transfers to CS:2D7C, Turbo's normal starting point. But the command line parameters have been inserted into the keyboard buffer, and Turbo behaves just as if you have typed them in.

To automatically enter the Edit mode of Turbo directly instead of just specifying the work file name, change the byte at CS:9BF7 from 57h ('W') to 45h ('E').

L Spiwak

The usual program patch simply replaces one or more bytes in the original program with new bytes. It may change default colours, skip parts of the code by patching in JMP statements, or eliminate commands by patching NOP commands over them, but the usual patch doesn't add new code. The unusual patch shown here illustrates a method for adding new initialisation code to TURBO.COM.

[illegible]

To sum it up, you first Load (L) the original file into DEBUG. Next you Assemble (A) a new JMP instruction at CS:100 — the very first instruction. The destination of this JMP is just past the normal end of the program. Assemble (A) your new initialisation code, starting at that destination, and end it with a JMP 2D7C. (If you're patching a version of Turbo other than 3.01A, this final JMP should match the original code at CS:100.) Reset CX to reflect the new file size and Write (W) the patched program.

DOS automatically parses the first two command line parameters of any program into these two spaces. However, since FCBs do not support pathnames, these FCBs are rarely used. Mr Spiwak has found a clever use for them in his patch — NR.

Fakemain

I've often lost Turbo Pascal programs because I failed to save them before running them. I made a mistake, and the computer locked up. If I had remembered to save the program first, I would have avoided spending hours of work rewriting it.

I found a way to make Turbo Pascal save your program automatically each time before it is compiled. The trick is to fool the compiler into thinking the work file and the main file are different. Just enter the work file (name eg, TEST.PAS), then enter the same name for the main file, but add an extra character (eg, TEST.PASX). Turbo considers them to be two different names, but DOS removes the extra character and interprets them as the same filename. When you compile the program, it will save the work file and load the main file before compiling. When you press Edit, it will reload the work file and go into the editor. This wastes time saving and loading the same file, but it gets the job done and can save hours of work if your program hangs and you have not saved it.

C Smith

A nice trick if you tend to blithely hit Run (R) without saving your program first. It could save your sanity — NR.

Preview

The function `Preview` waits for a keypress and extracts the character from the keyboard buffer directly, without removing it. My principal use for this function is to allow alternate input types without interfering with the normal `Read` routine, as, for example, in a case where numeric input is nor-

Fig 5 A DEBUG patch script for entering command line parameters like Y or N into TURBO.COM

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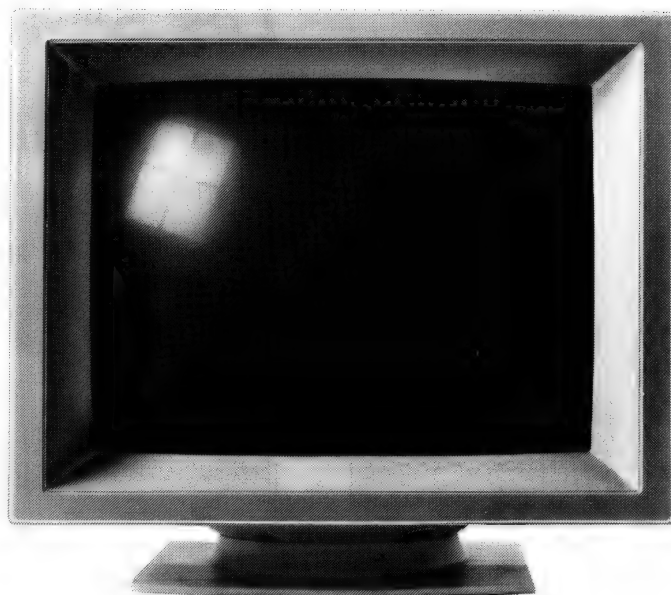
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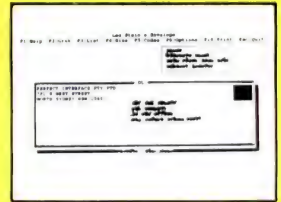
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```
{SR+}
PROGRAM Preview_Demo;
VAR
  ST : String[80];
  I,A : Integer;
CONST
  Zero = 48; { ASCII code for 0 }
  Nine = 57; { ASCII code for 9 }

FUNCTION Preview : INTEGER;
BEGIN
  INLINE(
    $B8/$40/$00/ { MOV AX,40h }
    $1E/ { PUSH DS }
    $8E/$D8/ { MOV DS,AX }
    $FA/ { AGAIN: CLI }
    $8B/$1E/$1A/$00/ { MOV BX,buffer_head }
    $3B/$1E/$1C/$00/ { CMP BX,buffer_tail }
    $FB/ { STI }
    $74/$F4/ { JZ AGAIN }
    $8B/$07/ { MOV AX,[BX] }
    $1F/ { POP DS }
    $89/$46/$04; { MOV [BP+04],AX }
  )
END;

BEGIN
  WriteLn('Enter text or numbers. <Esc> to quit');
  REPEAT
    A := 0; ST := '';
    I := preview;
    IF Lo(I) IN [Zero..Nine] THEN Read(A)
    ELSE
      IF Lo(I) <> 27 THEN ReadLn(ST);
      WriteLn;
      WriteLn('Previewed ASCII code = ',Lo(I),' Scan code = ',Hi(I));
      WriteLn('A=',A,' ST=',ST);
    UNTIL Hi(I) = 1;
  END.
```

Fig 6 A way to preview a key in the keyboard buffer

mal but the user can enter 'Q' to quit.

The sample in Fig 6 demonstrates the power of Preview. If the first key struck is numeric, entry goes into the Integer variable 'A'. Otherwise, it goes to the string variable 'ST'. Preview returns both the ASCII code and the scan code of the character in the buffer. To end the demonstration, I test for a scan code of 1, the Esc key.

D Winslow

Without this function, it's rather difficult to allow reading of different types of variables at once. The usual approach would be always to read a string variable, and then convert it to a numeric

type if appropriate. You may find other cases in which it's handy to read the next key pressed without first removing it from the keyboard buffer — NR.

Parsetrick

Here's an easy way to parse a string into substrings (words) separated by blanks. It uses Turbo Pascal's ParamCount and ParamStr functions. Start by declaring the variables shown in (a) in Fig 7.

The variable SimulateCommandLine occupies the same memory space as does the command line. If you fill the variable with a string that contains

```
(a)
VAR
  SimulateCommandLine : String[127] Absolute CSeg:$80;

(b)
SimulateCommandLine := StringVariable;
For I:=1 to ParamCount Do
  WriteLn(ParamStr(I)); { or whatever you want to do }
```

Fig 7 The variable declarations (a) and code (b) for parsing strings

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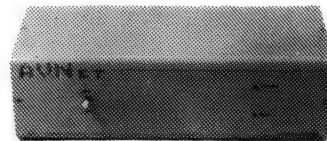
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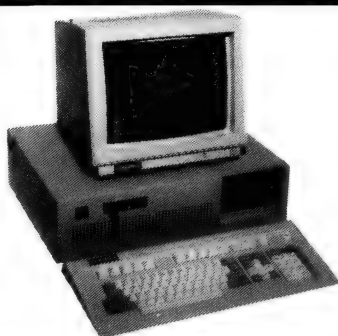
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```
{ $P1, G1, R+ }
PROGRAM Parse;
VAR
  SimulateCommandLine : STRING[127] ABSOLUTE CSeg : $80;
  I : Integer;
BEGIN
  WHILE NOT EoF DO
    BEGIN
      ReadLn(SimulateCommandLine);
      FOR I := 1 TO ParamCount DO
        WriteLn(ParamStr(I));
      END;
    END.
END.
```

Fig 8 A parsing filter using Turbo's command line parser

words or substrings separated by blanks, then the code fragment shown in Fig 7 (b) will parse the string.

This certainly is a lot less work and is more efficient than building a procedure or function that looks for embedded blanks and returns substrings. You can use this technique with different delimiters if you first make a pass through the string, converting them into blanks. However, the significance of having different kinds of delimiters is then lost.

D Schenck

I used Mr Schenck's clever trick to create a tiny parsing filter program shown in Fig 8. The { \$P1, G1 } compiler directive causes it to read from Standard Input and write to Standard Output. The input might come from the keyboard, or from a file, or even — via 'piping' — from another program. Compile the sample program as PTRICK.COM. Then the command

PTRICK < filename

will write a whole file to the screen with one word per line. That's not so useful in itself, but consider this command:

PTRICK < infile | sort > outfile

The result of this command is an output file that contains all the words in the input file in sorted order. You could compare this file to a dictionary file, or use it to generate a word-frequency count. And thanks to the ParamCount trick, the parsing program is elegant and tiny — NR.

Changing range names

Here is a quick and easy way to change the name of an existing range in 1-2-3. Start with /Range Name Create. When 1-2-3 displays the already-existing range names, select or

enter the name of the range you want to change. Hit the Edit key (F2), change the range name, and hit Enter. The old name has now become the new name. Watch out for one thing, however: be sure not to change an existing range name to a name that already exists. If you forget and accidentally do this, the range name you wanted to change will simply be deleted, and the one you wanted to change it to will remain unchanged.

R Dorchester

This is actually not a bad little trick. While I was playing around with this technique, I rediscovered that it's possible to have range names that are composed of spaces only. If you already have range names, you can't use /rnc to make such a range name because hitting the Spacebar just cycles you through the list of names you already have. However, you can make labels that are nothing but strings of spaces and give these names to the cells to their right with the /Range Name Label Right command. As an alternative, you can use Mr Dorchester's editing technique to change any existing range name into a space or spaces. Range names that contain only spaces are perfectly legal, although seeing a formula such as @max() or @avg() is admittedly a little disconcerting — JT.

Simulator tricks

I have found a trick for flying an F18 in the World War 1 Ace battlefield with SubLogic's Flight Simulator on the Apple II. I used the Flight Simulator II (A2-FS2) and JET (A2-JT1). Boot the JET program and then place Flight Simulator II into the active disk drive. Next, choose modes 1, 2, or 3; any skill level; and the F18 (carrier-based aircraft). To get to the battlefield, set the throttle to afterburner and imagine

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you are taking off from the carrier. Press the pitch-up key several times so you don't crash. As soon as you take off, go to a heading of approximately 245 degrees, which puts the battlefield in the direction of flight.
J Allan

Cameleon cursor

If you press Control-6 on the IIGS and then type a character, the character you press will become the new cursor shape. To change the cursor within a program, you might have a line like

```
320 PRINT CHR$(30):"M"
```

which would make the cursor change into an M (CHR\$(30) is the hexadecimal number for Control-6).

J Sintow

Printer master

We just bought a truckload of laser printers and had to create a whole new slate of .COM files to issue escape codes that would put them through their paces. To make creat-

```
ECHO OFF
IF %1==0 GOTO OOPS
ECHO N PRCODE.COM > PR.SCR
ECHO A >> PR.SCR
:TOP
IF %1==0 GOTO FINISH
ECHO MOV DL,%1 >> PR.SCR
ECHO MOV AH,5 >> PR.SCR
ECHO INT 21 >> PR.SCR
SHIFT
GOTO TOP
:FINISH
ECHO INT 20 >> PR.SCR
ECHO. >> PR.SCR
ECHO RCX >> PR.SCR
ECHO IIC >> PR.SCR
ECHO W >> PR.SCR
ECHO Q >> PR.SCR
COMMAND /C DEBUG < PR.SCR
DEL PR.SCR
ECHO PRCODE.COM created
GOTO END
:OOPS
ECHO Enter %0 and then the HEXADECEMAL
ECHO values (each FF or less) of the
ECHO printer codes you want to send, eg:
ECHO %0 1B 49 3
:END
```

Fig 9 PRCODE.BAT batch file to create PRCODE.COM programs that send escape codes to printers. (For this to work you need to have DEBUG.COM in your current subdirectory or in a directory that your PATH knows about.) This will create a file called PRCODE.COM, so be sure to rename any older version to prevent newer ones from writing over it. To run it, enter PRCODE and then, on the same line, the individual hexadecimal values of the codes you want to send to your printer. To send &H1B, &H49, and &H03 type PRCODE 1B 49 3

ing custom printer control files easy, we whipped up two programs to do all the dirty work. The first, PRCODE.BAT in Fig 9, does it from DOS. The second, PRCODE.BAS in Fig 10, does it from Basic. To run PRCODE.BAT, you need to have DEBUG.COM in your current subdirectory or in a directory that your PATH knows about. To run PRCODE.BAS you obviously need to have BASICA.COM handy.

PRCODE.BAT reads parameters from the command line and inserts them in a DEBUG script (to send the hex values &H1B, &H49, and &H03 you would type PRCODE 1B 49 3). You can enter several dozen codes on the same command line; the SHIFT command reads them in and substitutes them one by one for the %1 replaceable parameter in the ECHO MOV DL,%1 >> PR.SCR line. PRCODE.BAT then loops back and uses the IF %1@==@ GOTO FINISH test to see if there are any more command-line parameters to process. If it finds any, it concatenates them to the existing DEBUG script. If it doesn't find any, it jumps to the :FINISH label, adds the necessary DEBUG instructions to write the file, redirects the script into DEBUG by loading a secondary command processor (with COMMAND /C DEBUG < PR.SCR) to create the .COM file, and then erases the DEBUG script.

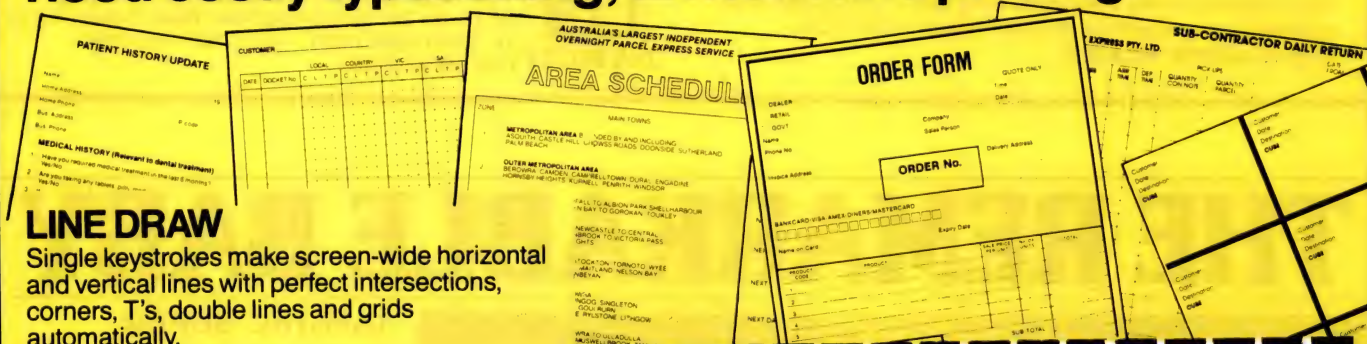
If the user doesn't enter any parameters, PRCODE.BAT prints instructions and then quits. DOS substitutes the actual name of the batch file for the %0, so you can rename PRCODE.BAT to whatever you want (with a .BAT extension). The process will make each PRCODE.COM file 284 bytes long, the maximum length this process can handle. Be sure to rename existing PRCODE.COM files before creating new ones so the older version isn't obliterated by the new.

While some users might argue that it really isn't necessary to rewrite the MOV AH,5 line each time, it's a good idea to do so since you can't always be sure the AX register will remain intact after an INT 21. Note also that some buggy versions of DOS have problems with an ECHO. statement; adding a period after ECHO simply sends a carriage return in most versions. If you do stumble over this problem substitute ECHO PC for ECHO. and ignore the error message DEBUG will give you — PS.

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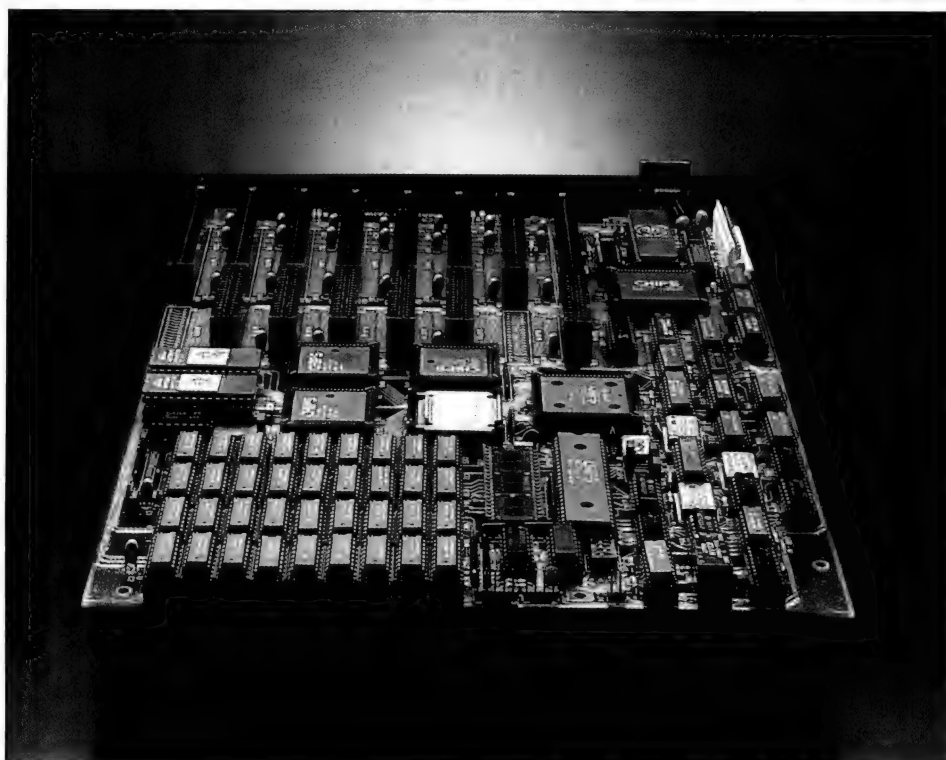
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```

100 'PCODER.BAS -- creates printer control .COM files
110 DIM Z$(20):K=1:US=CHR$(30)+STRING$(64,32)+STRING$(64,29)
120 KEY 9,"":KEY 10,"":DEF FNST$(Y)=MID$(STR$(Y),2+(Y<0))
130 BAD$=".,\+*?^[]=:;<>" + CHR$(34):KEY OFF:CLS
140 ' === name the file ===
150 INPUT "Enter 8-character name (WITHOUT EXTENSION): ",N$
160 IF N$="" OR LEN(N$)>8 THEN CLS:GOTO 150
170 FOR A=1 TO LEN(N$)
180 IF INSTR(BAD$,MID$(N$,A,1))<>0 THEN CLS:GOTO 150
190 NEXT N$:N$+=".COM":CLS
200 ' === print instructions ===
210 PRINT "Enter codes to send to your printer. ";
220 PRINT "Hit actual keys -- like <ESC> or A or 5 ";
230 PRINT "OR -- hit F9 then type a THREE-digit ";
240 PRINT "decimal ASCII code, eg <F9>255 or <F9>007";
250 PRINT "Enter up to 20. Backspace fixes errors. ";
260 PRINT "After the last one, hit <F10> to quit"
270 ' === main loop ===
280 IS=INKEY$:IF IS="" THEN 280
290 IF IS<>CHR$(8) THEN 310
300 IF K<2 THEN 280 ELSE PRINT US;:Z$(K)="" :K=K-1:GOTO 280
310 IF IS=CHR$(0)+CHR$(87) THEN 440
320 IF IS=CHR$(0)+CHR$(68) THEN IF K>1 THEN 570
330 IF LEN(IS)>1 THEN 280
340 IF IS=CHR$(27) THEN P$="<ESC>"
350 IF IS=CHR$(13) THEN P$="<ENTER>"
360 IF P$="" THEN P$="CHR$( "+FNST$(ASC(IS))+")"
370 PRINT P$;:P$=""
380 ' === display it and fill array ===
390 IF ASC(IS)>32 THEN PRINT TAB(13);":[";IS;"]";
400 IF K<20 THEN PRINT TAB(20);"(Enter up to ";20-K;"more";
410 PRINT " -- or hit <F10> to quit)"
420 Z$(K)=IS:K=K+1:IF K=21 THEN CLS:GOTO 570 ELSE 280
430 ' === direct entry ===
440 PRINT "CHR$(";
450 JS=INKEY$:IF JS="" THEN 450
460 IF JS=CHR$(13) AND C$="" THEN PRINT ")";:GOTO 550
470 IF JS<>CHR$(8) OR C$="" THEN 500
480 C$=LEFT$(C$,LEN(C$)-1)
490 PRINT CHR$(29);CHR$(32);CHR$(29);:GOTO 450
500 IF INSTR("0123456789",JS)=0 THEN 450
510 C$=C$+JS:IF VAL(C$)<256 THEN 540 ELSE S=LEN(C$)-1
520 PRINT STRING$(S,29);STRING$(S,32);STRING$(S,29);
530 C$="" :GOTO 450
540 PRINT JS;:IF LEN(C$)<3 THEN 450 ELSE PRINT ")";
550 IS=CHR$(VAL(C$)):C$="" :GOTO 390
560 ' === program creation ===
570 OPEN N$ AS #1 LEN=1:FIELD #1,1 AS D$:FOR A=1 TO K-1
580 LSET D$=CHR$(178):PUT #1:LSET D$=Z$(A):PUT #1
590 LSET D$=CHR$(180):PUT #1:LSET D$=CHR$(5):PUT #1
600 LSET D$=CHR$(205):PUT #1:LSET D$=CHR$(33):PUT #1
610 NEXT:LSET D$=CHR$(195):PUT #1:CLOSE:PRINT N$ " created";

```

Fig 10 PCODER.BAS program to create PCODE.COM files that send escape codes to printers

Preserving the environment

When I work on someone else's system, I often want to change the path or prompt temporarily. But I always want to leave things the way they were originally when I finish. The easy way to do this is to issue the command

SET > RESET.BAT

before I make any changes. This puts all the environment settings into a RESET.BAT batch file. When I'm done, I just type RESET and DOS puts things back the way they were.

COMSPEC and other environment variables require SET COM-SPECT=xxx phrasings, so RESET.BAT will produce a brief flurry of harmless error messages as it executes. On the rare occasions when you do need to change these, you can always customise RESET.BAT with your word processor.

R Anderson

In DOS 3.3 this can also reset the APPEND string, if one were placed into the environment with an APPEND /E command. Around our offices we're always working on other systems and changing the PATH and PROMPT. This technique is a real timesaver — PS.

Format protection

There's a simple and effective way to stop nasty or inexperienced users from wiping out a hard disk using the FORMAT command. Just rename an internal DOS command to FORMAT, and then rename FORMAT.COM itself. After this change, typing FORMAT C: will just produce an 'Invalid number of parameters' message.

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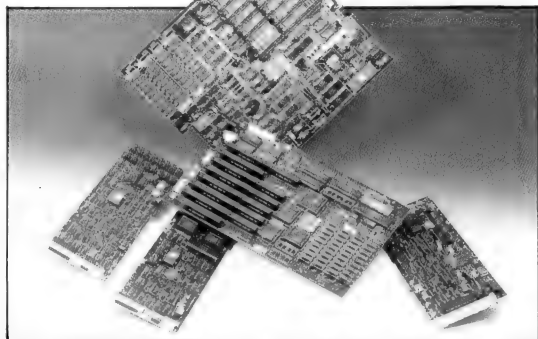
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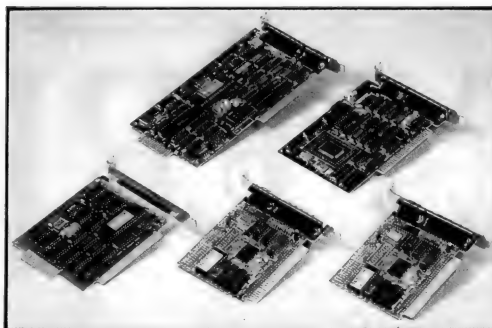
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COMMAND.COM won't let you run a program with the same name as the name of an internal command like TYPE, RENAME, or VER. It keeps these internal commands in a built-in table, and this technique simply replaces the six-letter RENAME table entry with FORMAT. If you replace RENAME with FORMAT, you'll still be able to use REN to rename your files, but COMMAND.COM won't recognise the longer (and former) RENAME command. And it won't let you run your external FORMAT.COM program.

If you type in FORMAT or FORMAT C: at the command line, COMMAND.COM will think you typed in RENAME or RENAME C: and will simply print out an error message.

You could use either The Norton Utilities or DEBUG to change RENAME to FORMAT. Once you've patched COMMAND.COM, use REN to rename FORMAT.COM to FORMAT?.COM (where ? stands for an ALT+255 null). To do this, type

REN FORMAT.COM FORMAT

but don't hit the Enter key yet — hold down the Alt key and type 255 on the numeric keypad, then release the Alt key. The cursor will move over one space. Then type

.COM

and hit the Enter key.

Finally, create a batch file called F.BAT:

```
echo off
cls
echo.
echo Insert disk in drive A: and
pause
format a: /v /s
```

Remember to type in format□ (where □ represents Alt+255) when creating your batch file, or this won't work.

One word of warning: don't keep different versions of COMMAND.COM on the same system or DOS will become confused. It's a waste of space. And that's what SET COMSPEC is for.

It's true that a power user could bypass this by booting off a disk in drive A:, but, for that matter, that someone could just pour coffee on or set fire to a hard drive to kill it. But my feeling, based on extensive experience with users at all levels, is that probably the most dangerous crowd, in terms of wiping out disks just for the hell of it, are users who do not have that much experience with PCs.

J Sperling

To patch COMMAND.COM with DEBUG, first make a backup copy of COMMAND.COM called COMMAND.BAK so that if you make a mistake you can start again. Then type

DEBUG COMMAND.COM

Find out how long your version of COMMAND.COM is by typing

RCX

and hitting the Enter key twice. You'll see something like

CX 62DB

Next, take the four-digit hex number after the CX and type the following:

S 100 L62DB "RENAME"

(substituting the four-digit hex number if yours is different from 62DB). Then hit the Enter key and next you should see something like

61B2:547B

Ignore the first four digits (the ones preceding the colon). Take the right-most four digits and type

E 547B "FORMAT"

(substituting the four-digit hex number if yours is different from 547B). Hit the Enter key. Then hit W (and Enter) to write the new version back to disk, and Q (and the Enter key) to quit DEBUG. Once you've patched COMMAND.COM, reboot your computer.

Another simple way to prevent unwanted formatting is to rename FORMAT.COM to something innocuous like DATA.COM and then insert a simple reboot routine at the beginning of your old FORMAT.COM file. Type in FORMAT and the system will reboot. Type in DATA and you can format disks. The following DEBUG will create both files. Create it with a pure-ASCII word processor, or use the DOS COPY CON command. Name the file FORMAT.SCR

N FORMAT.COM

```
L
N DATA.COM
W
N FORMAT.COM
E100 B8 40 00 8E D8 B8 34 12
E108 A3 72 00 EA 00 00 FF FF
W
Q
```

Be sure to hit the Enter key at the end of each line, especially the last one (with the Q). Then type

DEBUG < FORMAT.SCR

You could, of course, create a tiny 16-byte reboot file called FORMAT.COM, but the short length would be a tipoff to

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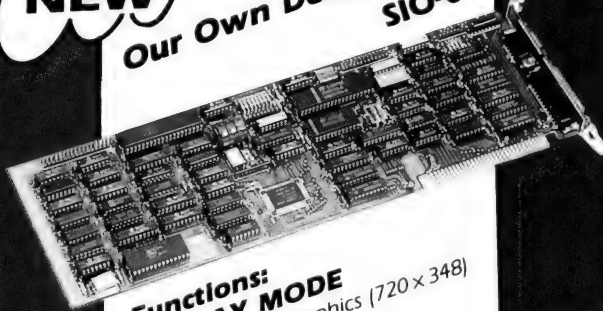
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an unauthorised user that something was amiss — PS.

Multiple choices

Commands like COPY and DIR don't take multiple arguments. A way round this is to have DOS do the command multiple times, each with a different argument. For example, to copy all .COM and .EXE files to a floppy disk, you could type

```
FOR %F IN (*.COM *.EXE) DO
COPY %F A:
```

While this works, DOS will grind through the process one file at a time rather than ganging things up as it does with wildcards. Using a FOR loop on the command line isn't limited to just filenames. DOS commands can also be used as FOR loop variables as in

```
FOR %C IN (COPY ERASE) DO %C
A:*.EXE
```

to copy .EXE files from a floppy disk, then erase them from the disk.
G Walsh

Another way to do multiple copies on the same command line is to use piping. The following command will copy all your .COM and .EXE files to drive A:

```
COPY *.COM A: : COPY *.EXE A:
```

Also, if you try the above FOR . . . IN . . . DO technique, remember to use single % signs only in direct mode (at the DOS prompt); in batch files you have to use double %% signs — PS.

Zero-byte files

I have some questions about hidden files and zero-byte files on my IBM PC.

When I use the command

FORMAT A:/V

and I later check the disk with CHKDSK, why does it show '0 bytes in 1 hidden file'? How do I delete that file? Not only can't I delete it, I can't find it using The Norton Utilities.

Also, why does the DOS command

REM DIR>ABC

create a zero-byte file called ABC? (This one I can delete.)

B Richrath

When you format a disk with the /V switch, FORMAT adds a volume label (simply a name of 11 characters or less) to the disk. DOS has to put this volume label somewhere on the disk, so it creates a directory entry for it. It has zero bytes because it doesn't have any data associated with it. The volume label is a special directory entry that doesn't show up in normal file listings. (DIR, VOL, and CHKDSK can, of course, retrieve the volume label and display it.)

If you don't want the volume label on the disk, don't format with the /V switch. If you want to remove a volume label from a disk, you can use the LABEL command included in DOS 3.0 and above:

LABEL A:

When the LABEL command asks what the new volume label should be, press Enter. When it asks 'Delete current volume label (Y/N)?' answer with a Y.

In your second example, when you enter the command

REM DIR>

The '>' symbol is DOS's redirection symbol. This directs display output from a command into a file. So, when DOS executes this command, it first creates a file called ABC. Then it executes the REM DIR command. But REM doesn't display any output. When REM finishes up with what it has to do (which is basically nothing), DOS closes the ABC file. The file is empty.

In DOS versions up through 3.2, there's no way around this. However, the recently introduced DOS 3.3 lets you use inactive redirection symbols in commands by enclosing the command line in quotation marks thus:

REM "DIR>ABC"

Listing all files

Is there a way to display or print the contents of all files on an IBM PC hard disk with just a simple command? I've been using a batch file that executes a DIR command with each of my subdirectory names, but I have to edit the batch file whenever I add a new directory to the hard disk.

C Pegler

If you need only the names of the files and subdirectories, the CHKDSK command can do it. Enter

CHKDSK /V

The /V switch stands for 'verbose.' If you want to direct the output to the printer, simply type

CHKDSK /V >PRN

However, the CHKDSK command lists only the names of the files without the file sizes, times, and dates.

To execute a DIR command for all subdirectories on a hard disk, I often

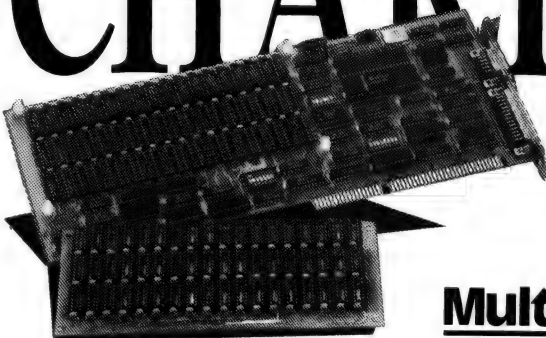
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use a program called *SWEEP* (supplied with a range of other utilities on APC's Utilities Disk to subscribers). This program repeatedly executes a command in the current directory and all nested subdirectories of the current directory.

Thus, to get a *DIR* listing of all your subdirectories, you enter

SWEEP DIR

or, to print the output on the printer,

SWEEP DIR >PRN

If you have a modem and communications software then you can download it from Microtex on Telecom's Viatel page *6663# (call (03) 531 8411 for details) — CP.

Commodore pot-pourri

(1) An undocumented feature of Basic 7.0 for the Commodore 128 is its ability to treat MID\$ as both function and command.

Try this sequence in direct mode:

```
AS = "AAAAAAAAAA"
MID$(AS,4,4) = "ZZZZ"
PRINT AS
```

The displayed result will be "AAAZ-ZZZAAA".

This feature is very useful for setting up fields in relative or direct-access disk records and is almost an emulation of Microsoft Basic's LSET command. By combining its use with that of the POINTER function, you can even store large floating-point values on disk as five-byte fields. Think about it!

(2) If, like me, you dislike the full flashing cursor in CP/M mode on the 128, you can change it, provided that you have registered your CP/M ownership and received the additional utilities disks from Commodore. Believe me, the CP/M User Guide included in this package is well worth the additional \$50 fee on its own.

The source file you must path is CX80.ASM, which you will find on Source Disk 1.

Using ED, WordStar or any other text-handler, locate in CX80.ASM the comment line: 'program the 8563 for full flashing cursor'.

The line of code you must alter is the third line below that command and reads 'mvi a,40h'.

It is the argument in this line that determines the cursor's shape and attributes:

40h = full flashing cursor
00h = full non-flashing cursor
47h = flashing underline cursor
07h = non-flashing underline cursor

Change the value of the argument according to your own taste, save the amended file and then follow the procedure outlined in the file MAKESYS.DOC. This will create a new CPM+.SYS file which you can PIP to all your disks to ensure that the cursor pleases your eye whenever you boot up CP/M.

(3) Why waste valuable disk space with fancy menu programs on your '64 when you can get the 1541's directory itself to do the job without sacrificing a single byte of extra storage?

Whenever you save a Basic program, add these four keystrokes to its filename before closing the quotes and typing the ".8" extension:

SHIFTed SPACE
Commodore - D
Commodore - U
SHIFTed -

To run a program that has been saved in this fashion, simply load and list the directory, run the cursor up to the appropriate line and press SHIFT-RUN. Try it — you'll soon see why it works!

(4) One of the most regrettable weaknesses of the '64's Basic is the absence of the IF...THEN...ELSE construct, but you can approximate it with this coding:

ON -(condition) GOTO
XXXX:alternative statements

By negating the test condition, you can get only two possible results: 1 (true) or 0 (false). If the condition is true, control passes to line XXXX; if not, the alternative statements in the current line are executed. This code therefore produces the same logic flow as:

IF (condition) THEN XXXX ELSE
alternative statements

(5) If you ever inadvertently scratch the wrong Basic program, you can recover it immediately by issuing a LOAD "*,8 command, provided that you do so before referencing another file or resetting the 1541.

Kevin Riordan

Microsoft Basic Compiler

Every Mac program compiled by the

Microsoft Basic Compiler, when run, immediately displays a window upon start-up. A lot of the time this window differs from the main window of the program you wrote. Besides that, this window is a dead giveaway that you wrote your program in Basic. Using a disk/file editor application, you can patch your compiled program to eliminate this window.

In the resource fork of the program, search for the hexadecimal string '00 29 00 02 01 54 01 FC' and replace it with all zeros. Save the changes to your file and you're off.

C Laudenbach

Excel

It is annoying to reopen a number of linked documents and be constantly presented with the 'Update Reference to Non-Resident Sheets' message. Clicking on either choice will update the worksheet or chart automatically, and that can take some time. One solution to this problem is to use the Resume Excel documents. (A Resume Excel document is created each time you choose QUIT from Excel. It contains information on what documents were open and where they were placed right before you quit.)

Before starting, remember what documents reference others, including worksheets, macro sheets and charts. Remember to include all linked files. Enter Excel and open the related documents. Activate, either by clicking or using the Windows menu, all documents in the following order. First activate all the charts, then all worksheets and finally, if you have any, all macro sheets. Now choose QUIT from the File menu.

After Excel returns you to the Finder, in the same folder (or disk) as Excel, you will find a Resume Excel document. Rename that document, so the next time you quit Excel it doesn't get replaced. Next time you want to open your linked documents, simply double-click the renamed Resume document.
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A Henrick

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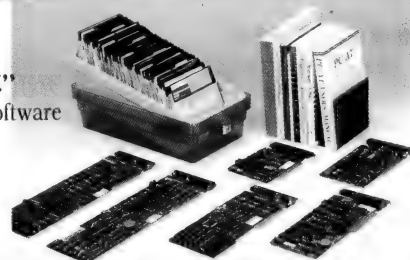
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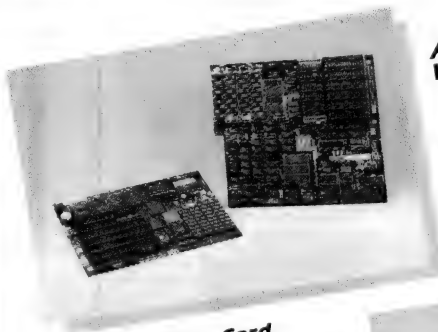
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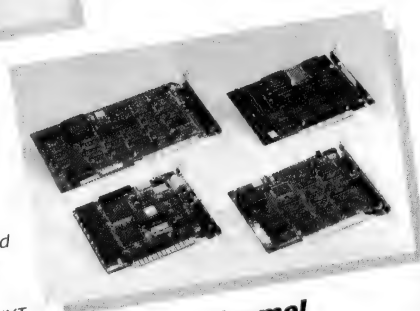
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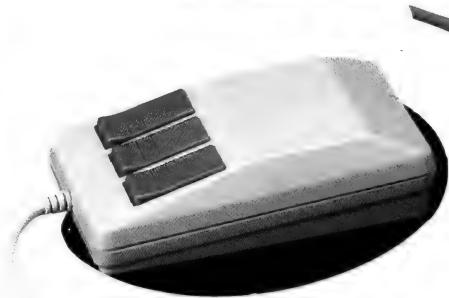


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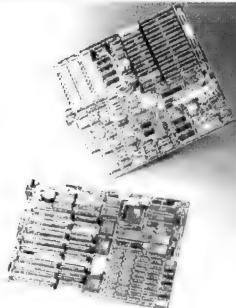
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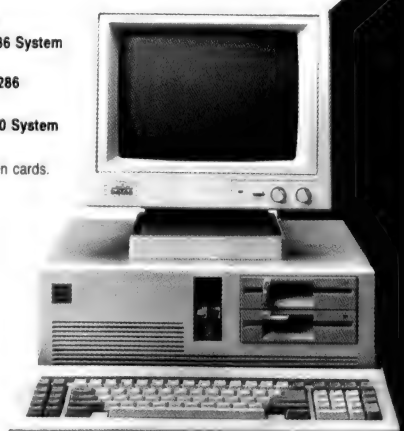
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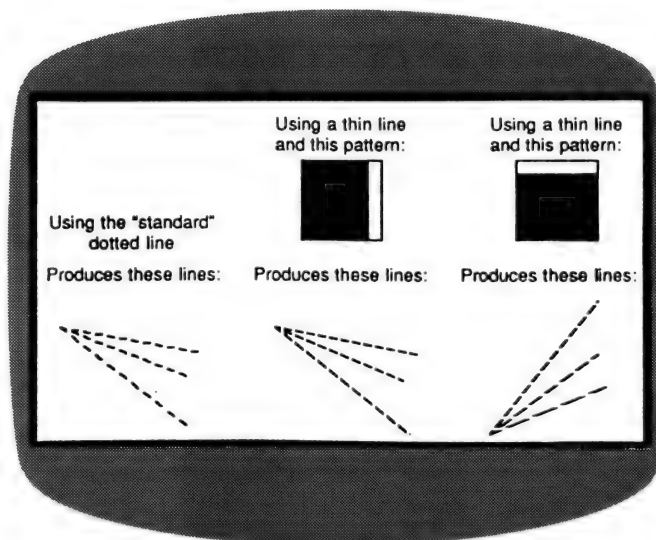
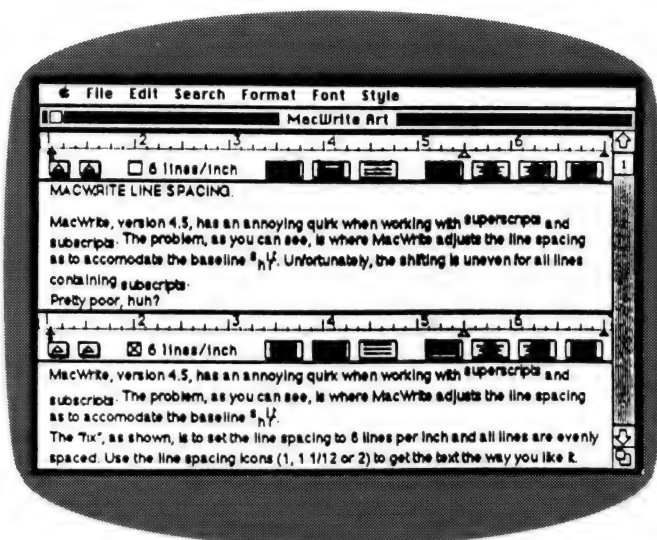
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In order to obtain even line spacing, when using subscripts in your text, specify in the ruler that the spacing is to be 6 lines per inch

Since the dotted lines in MacDraft look very poor, create a pattern as shown and use a thin line with that pattern as the line pattern to produce clearer dotted lines

MacWrite

MacWrite, version 4.5, has an annoying habit of incorrectly adjusting the line spacing of all lines that contain subscripts. The very simple solution to this problem is to specify, in the ruler, that the text to follow is to be 6 lines per inch. When this is done, all lines will have the same line spacing. Use the line spacing icons (1, 1.5 or 2) to adjust the way you like it.

R Preece

ZBasic

If, on your Mac, you're using the Edit window and make a number of changes to various, nonsequential line numbers, simply use COMMAND-E twice and all lines and line numbers will be placed in their proper locations.

M Diehr

System 4.1

You can use COMMAND-PERIOD to cancel all standard dialog boxes (the dialogs you get when you choose OPEN or SAVE). This will work for all applications.

I Donitz

MacDraft

Diagonal dotted lines normally print poorly on a LaserWriter. However, you can produce quality diagonal lines with MacDraft. Here's how.

Start by editing a pattern so that most

of the pattern is black, with a one or two pixel column (or row) being white. Once that is done, confirm that you are drawing with one of the non-dotted lines, and choose that special pattern you have drawn as the ink for the line. This is done by holding down the Option key while selecting the pattern.

Try drawing a few diagonal and/or dotted lines. Later, you can alter the special pattern for better control over the depth of the pattern.

Z Chen

MacFile

Typing OPTION-RETURN in a field will generate a line feed at the insertion point, allowing you to create lists. This embedded character acts like a normal Return when copied and pasted into a word processing or spreadsheet application.

In addition, SHIFT-CLICK will select the entire field, thus avoiding having to scroll.

C Laudenbach

Mac SE

(1) Using ResEdit, it is possible to remove a few unnecessary resources from the System file. These resources may only be removed if you are using System 4.1 and the Mac SE. The PTCH resources are 'patches' to a particular machine's ROMs. The unnecessary PTCH resources are those numbered 28927, 105, 117 and 376, which are the patches for the ROMs of the

Mac XL, Mac 512, Mac Plus and the Mac II, respectively.

In addition, now that the SANE (Apple's high-level mathematical routines) functions are found in the SE's ROM, you are able to remove them from the System file. The SANE resources are PACK 4 and PACK 5.

As always, only use ResEdit on a backup copy of your software.

J Peskoff

(2) Since the Macintosh SE can have two built-in floppy drives and one external floppy drive, the Command-Shift keyboard commands for ejecting disks are a little different. COMMAND-SHIFT-1 will eject the bottom (internal) drive, while COMMAND-SHIFT-2 will eject the upper drive. The new Command-Shift combination for ejecting the external floppy drive is COMMAND-SHIFT-0.

J Liemandt

END

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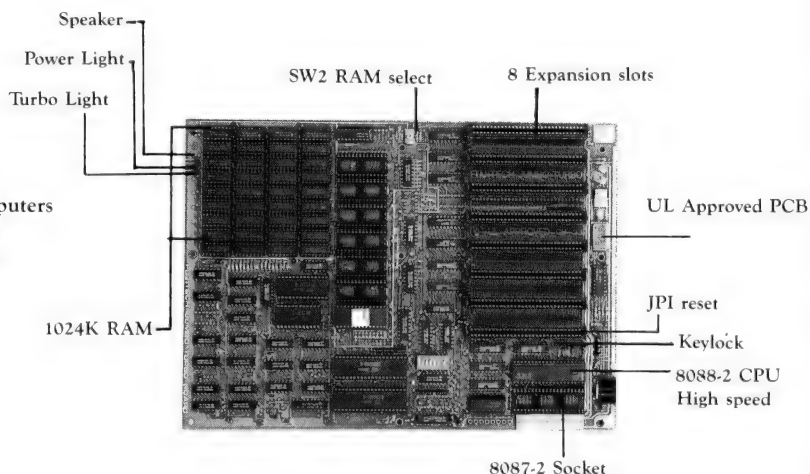
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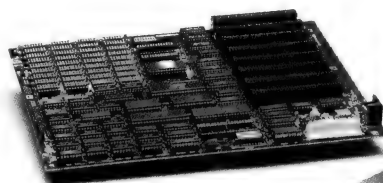
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High speed access

This month Steve Withers discusses V32 modems and the falling price of fast data communications.

Having mentioned V32 modems in the last issue, I thought it would be worth describing a couple of products in this class. They are the Codex 2260 and the CDS V32 Trellis.

As you might expect, they have much in common. Both devices run at 9600 or 4800 bits per second and can be used with or without Trellis coding. Although Trellis coding is intended to allow dial-up communications at speeds previously restricted to dedicated lines, line quality is still an issue. For this reason, both modems include an 'eye pattern generator' which (when connected to an oscilloscope) allows the quality of the connection to be monitored. As you might expect, they are both auto-answer, auto-ranging devices. Echo cancellation is also provided.

The Codex 2260 also provides auto-dialling, by means of the AT command set or its own codes. An attractive feature is its 'front panel' with a 16 character LCD used to provide menu-driven configuration. Up to four configurations can be stored in non-volatile memory, along with nine telephone numbers. The 2260 costs just over \$5000, and is available from JN Almgren on (02) 406 6177.

Datacraft may be contacted on (03) 727 9111, and the price of the CDS V32 Trellis modem is approximately \$5300. An auto-dial version is available at a higher price.

Modem prices

Last month I remarked that the price of V22 modems had fallen below \$500. Just a few days after the editorial deadline I heard about a Telecom approved, brand-name V21/V22 for less than \$400. Faster communication is becoming increasingly affordable.

Custom Menu

Custom Menu is the name of a locally written DOS shell for IBM PCs and compatibles which has been advertised in APC in recent months. Unfortunately, the author and distributor have discovered that the package is available for downloading from several bulletin boards. They are understandably upset about the situation, as Custom Menu is neither public domain nor Shareware.

If you see it on a board, why not leave a message to the Sysop to take appropriate action? I'm sure those of you who have already downloaded it will either erase it or order a copy from Martlett Software.

The speed with which software spreads around BBSs is generally an advantage. Problems like this arise because we expect all the software on a board to be legitimate. If something sounds interesting and useful, we download it, pass it on to some friends, and perhaps upload it to another board or two.

Considerable embarrassment can be caused to Sysops and the whole bulletin board community when someone knowingly uploads commercial software, so it's fortunate it is an uncommon event.

System news

There're quite a few new listings and updates this month, but I'll point out a couple of highlights. TNT Shuttle (Sydney) deserves a mention because as far as I know it is the first BBS to run on one of the new IBM PS/2 machines.

Tasmanians now have a second BBS with the arrival of the Hobart Users board.

It is understandable that country areas are not particularly well endowed

with bulletin boards, so I was pleased to hear about the Mudgee Connection. Acknowledgements: Roger Atkinson, Jeff Campbell, Bill Cholakovski, Larry Lewis, Andrew Moore, Greg Noonan, and Richard Siggs.

New systems

NSW

Alpha Juno (02) 774 1543. Kevin Withnall. 6pm- 6am daily. V22 only.

First Nice MIDline (02) 868 4347. P. Andrew Khoo. V22, V22bis, Bell 103. FidoNet 711/805.

Galactic Federation (02) 233 5040. Kevin Gladwin. 5pm-9pm weekdays, 24 hours weekends. V21, V22, V22bis, V23.

TNT Shuttle (02) 281 2476. MV. Paul Birch. V21, V22, V22bis, V23, Bell 103, 212.

Mudgee Connection (063) 72 1898 P. George Rhedey. 9pm-7am daily. V21, V22, V23.

ACT

Canberra KBBS (062) 88 0142. MV. 'GEO'.

Vic

Angler's Den (03) 876 4118. 6pm-10pm weekdays, 24 hours weekends. V21, V22, V23.

Maxitel (03) 882 6188. P. Mark Micallef. *Deepseas* (03) 762 9204. P. John Drinkwater. 11pm-6am daily. V21, V22, V23. FidoNet 630/308.

WA

Atari Forever (09) 342 3739. 24 hours. *Lightning* (09) 275 7900. MV. Simon

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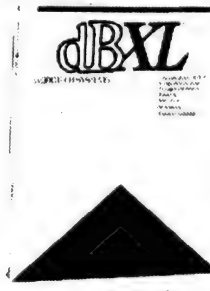
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Murdoch University External Studies (09) 332 2604. MV. Roger Atkinson. 24 hours daily. Voice enquiries (09) 332 2597, (09) 332 2492.

West Coast (09) 445 3080. MV. Mark Gaynor.

Tas

Hobart Users (002) 49 4405. MV. Denise Webber. 3pm-7am weekdays, 24 hours weekends.

Updates

NSW

Adventure Line (a.k.a. Auz Line) Off line.

AED-Prophet Off line

Amstrad (02) 981 2966. M. Riccey Schmah. V21, V22, V22bis, V23.

Augur (02) 661 4739. MV. Mark James. 24 hrs daily. V21, V22, V22bis, V23.

Ausborne (02) 439 7072. MV. Daniel Moran. 24 hours daily.

Australian Pick Users (02) 631 8603. MV. Kurt Johannesen. 24 hours daily. V21, V22, V22bis, V23.

Bounty Off line

Comm Link Off line

Commodore 64 (02) 664 2334. MV. Graham Lee. 24 hours daily. V21, V23. (Incorrect entry in July APC — sorry Graham)

Commodore Pursuit (02) 522 9507. MV. Warren Hillsdon. 24 hours daily. V21, V22, V23 (NetComm 123A).

Datacomm Off line.

Microlink (02) 477 7509. Tony Calahan. 24 hours daily. Formerly listed as *Zenith*.

Omega Line (02) 457 8281. P. Geoff Arthur. 24 hours daily. V21, V22, V23. FidoNet 59/12.

Prophet (02) 628 5222. P. Larry Lewis. V21, V22, V22bis, V23.

Spring Board Off line.

Syntax's Error Off line.

Your Computer (02) 669 1385. MV. Andy Farkas. 24 hours daily.

ACT

ACT Amiga Users Group (062) 59 1137. MV. Mike Hurst-Meyers. 24 hours daily. V21, V22, V22bis, V23, Bell 103, 212. FidoNet 626/218.

ACT Pharmacy (062) 92 3875. MV. Michael Pye. V21, V22, Bell 103, 212. FidoNet 626/223.

Gateway Off line.

Professional Computer Users Group

(062) 59 1244. MV. Alan Salmon. 24 hours daily. V21, V22, V22bis, V23. FidoNet 626/229.

Vic

PC Domain Off line.

The Magic Pudding Off line.

The Real Connection (03) 288 0331. P. Carla Miller. 24 hours daily. A FidoNet system.

Qld

Comtel (077) 753 636. MV. Warren Mason. 24 hours daily. Formerly located in the ACT.

Microlynx Temporarily off line.

RALF Off line.

Rapple-Q (07) 284 6145. Graham Black. 24 hours daily. V21, V22, V23, Bell. Includes on-line games.

Redcliffe City Council Library (07) 283 0315. 6pm-8am Mon-Fri, 24 hours weekends. V21, V22, V22bis, Bell. FidoNet 640/203.

SA

Omen V (08) 259 5321. MV. Richard Sigs. 24 hours daily.

WA

Apple Board Off line.

Streamline Off line.

END

The material in this column is presented in good faith, but as it is collated from material provided by readers, APC cannot take responsibility for its accuracy. New information and corrections are always welcome (but please mention whether or not you can vouch for accuracy of the material provided), and should be sent to:

Steve Withers, C/- Computer Publications, 47 Glenhantly Road, Elwood, Vic 3184 or to Viatel mailbox 063000030.

Acknowledgements will normally be made through this column. You may also like to send a copy of the information to the Australian PAMS Coordinator at one of these addresses:

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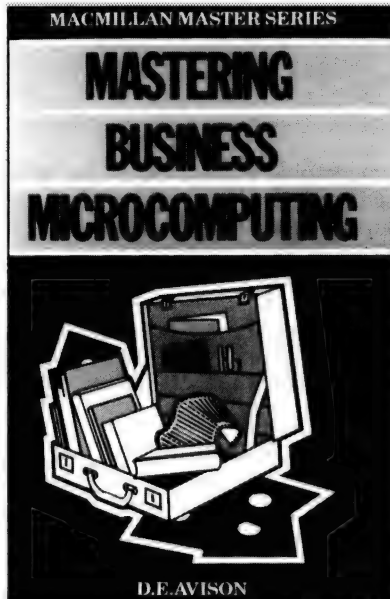
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In our crop of books under review this month, there's something for everyone — from Electric Monks to microcomputers and children.



Mastering Business Microcomputing

Author: DE Avison

Publisher: Macmillan Master Series

Price: \$9.95

There is a plethora of books on the market that claim to be 'the businessman's guide to microcomputing'. Some good, some adequate, some a waste of time and money. Thankfully, DE Avison's *Mastering Business Microcomputing* does not fall into the latter category. If anything, it is among the elite of books that I have read dealing with this topic. It concentrates on applications which are of most interest to managers of small/medium-sized companies, and the author's 'aim is to keep the book readable and to avoid unnecessary technical detail'. He also keeps clear of any preferences in hardware and software.

Each chapter opens with a concise and pertinent introduction to the individual sections, informing the reader of the information to be discussed and

exactly where to find it in the chapter. Chapter 1 covers the nail-biting subject of choosing a microcomputer system and deserves to be re-read until all the salient points are driven home. I was pleased to see emphasis placed on the quality of documentation, help facilities and the availability of a disk tutorial system within a package as so often with the purchase of a microcomputer and/or application packages, the 'new' user doesn't realise until it is too late that most of his knowledge will be self-taught.

'Word processing and the electronic office' is the first application to come under close scrutiny — logical enough, as it is one of the main areas of microcomputing. Plenty of diagrams and illustrations here, showing possible screen formats and text layouts, and also the real aspects of people and ergonomic factors are discussed: 'If human factors are given the importance that they deserve, then the business stands a far greater chance of the computer system being a success.'

File management, spreadsheets, financial modelling, graphics, accounting applications and integrated systems are all treated with equivalent details in individual chapters, and the advantages and disadvantages of different systems are discussed clearly and fairly.

Mastering Business Microcomputing is a very useful book to learn from initially and a handy reference book for all times: a worthy addition to the Macmillan Master Series.

Lorna Kyle

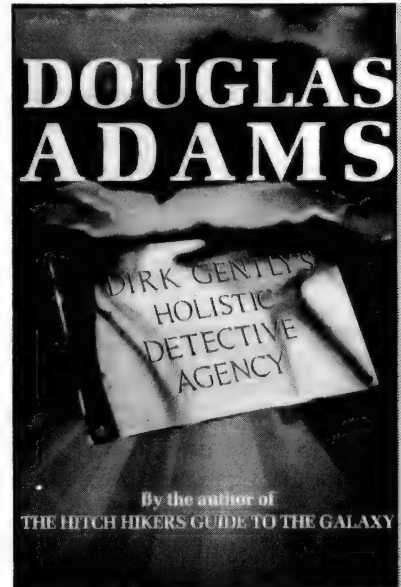
Dirk Gently's Holistic Detective Agency

Author: Douglas Adams

Publisher: William Heinemann & Co Limited

Price: \$27.95 (subject to change)

There's no doubt from reading this book that Infocom has already got its hands on it. And considering that the



HitchHikers Guide to the Galaxy, by the same author, is the company's best-selling adventure after *Zork*, it's not really surprising.

Every event, feeling or movement is accompanied by a long description, written in pure Infocom-ese. My favourite is that of the bathroom. After a couple of dozen sentences about lavatories, basins and bathroom cabinets, the text ends: 'There was also a large horse in the room, taking up most of it.'

The story, for it is fiction and not like a normal computer book, is set in the present day. It's also set in the past and future, too, as each of the 36 short chapters takes us to a different place and time. Fans of *The Singing Detective* should feel quite at home.

Like earlier Adams books, this one gives more than a passing mention to PCs. Our hero, has a network of six Macs, as well as a Laserwriter. Most of the time, the screens show a picture of a revolving sofa stuck halfway up a staircase, though the exact reason for this is not clear.

BIBLIOFILE

Staying with technology, my favourite character is the Electric Monk. In the same way that dishwashers perform the tedious job of doing your washing up, and video recorders watch all the boring TV programs that you don't want to watch yourself, the Electric Monk is a robot-like device that will believe anything it is told, to save you having to believe it yourself.

Although such a device is certainly useful, not many have been sold yet as everyone's waiting for the Monk Plus to be launched.

Holism, by the way, is the theory that the fundamental principle of the universe is the creation of wholes. And Dirk Gently's holistic detective agency has a brass plaque on the door that says: 'We solve the *WHOLE* crime. We find the *WHOLE* person. Phone today for the *WHOLE* solution to the problem. Missing cats and messy divorces a speciality.'

If you like Douglas Adams books

and/or Infocom adventures, you'll find this a good read. It's handy for the coffee table, too, to let guests dip into during dull moments. I'd even go so far as to say that, if you don't have a coffee table, it's worth buying one just to put this book on.

What's the plot? Oh, I've no idea.

Helen Rappoport

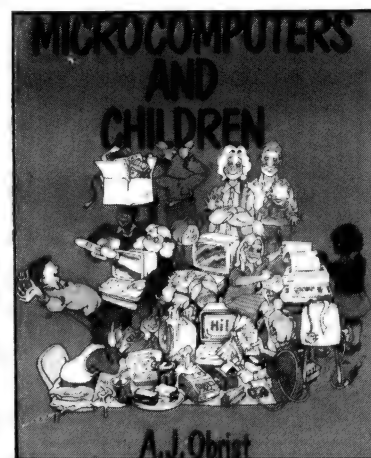
Microcomputers and Children

Author: AJ Obrist

Publisher: Hodder & Stoughton

Price: \$19.95

Here is a sensible and straightforward guide to microcomputers for parents and teachers alike. As the author points out, the micro is here to stay — 'its influence and importance will grow and grow' — and the sooner that schools are able to utilise it and all its encompassing advantages the better.



Microcomputers and children is not a massive tome — only 100-odd pages — but it covers the basic introduction to micros, what they are, how they work (we're not talking complex issues

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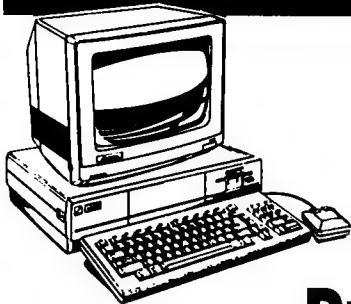
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here, just simple cassettes and television screens), how to set about buying a micro, selecting programs and choosing software. A strong emphasis is placed on micro games and how children learn through play, explaining certain popular games and illustrating how they help develop reasoning power and decision-making abilities. The author describes the games available for young children which help to teach colours, shapes, numbers and reading, while for older children he describes the more specialised games ('content-free' programs) which enable the development of games and simulation themselves. Any game or program mentioned is included in the appendix where it is also classified under subject and age group.

A very interesting chapter is included on how the micro can be used by children of different capabilities, ranging from the gifted through to those with physical handicaps or learning difficulties. There is also a short section on flow-charts and programming which mentions Logo and the turtle, Prolog and Basic.

But don't expect this book to give you

anything more advanced than that. *Microcomputers and children* is geared towards pre-school and primary education; it won't help you solve the finer details of your spreadsheet package, but then perhaps your seven-year-old may already know the answer to that one.

Lorna Kyle

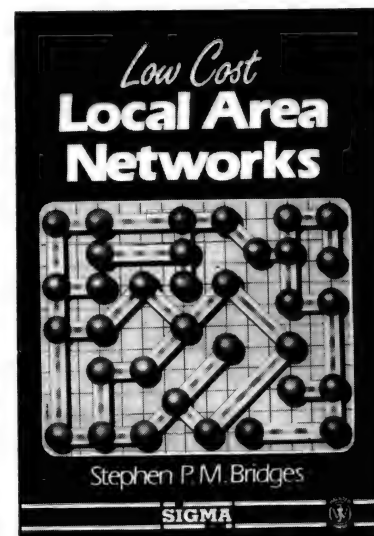
Low Cost Local Area Networks

Author: Stephen P M Bridges
Publisher: Sigma Press/Jacaranda Wiley

Price: \$32.25

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'empty slot', 'buffer insertion', 'token passing', and so on. Once again, users who initially understood the concept, application and reason may have become lost in the jargon and ambiguity.

Stephen Bridges could have gone

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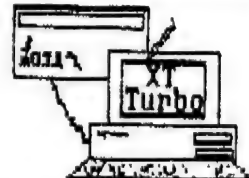
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some way to lifting the veil of confusion had his book been laid out differently: it is almost back to front. The technical section comes first, plunging the reader into transmission mediums and modes, and access and signalling methods; while the second section deals with the practical side — that is, what do you want from a LAN? If this book is aimed at the engineer, then Section Two isn't really relevant; if it is aimed at a user manager — that is, a novice to LANs — then I'm sure that they would never have completed Section 1.

On the other hand, the sections independently are quite concise, and when the author is dealing with practical questions such as 'Can it easily be connected to your equipment?', then you feel that he is really on your side. Also, if you are slightly technically-minded and know your broadband from your baseband, then you'll be okay in Section 1.

In conclusion, study the 'Contents' pages first and read the chapters in your defined order; all the terms used are ultimately explained but you do have to search for them.

Lorna Kyle
 END

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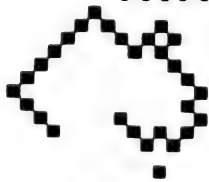
They are loaded with extra features you don't pay extra for such as the built-in push-feed tractor and downloadable IBM and international character sets. They are amazingly low priced and known for their reliability

which is backed by a solid six month warranty and Datronics nationwide service network. They are available from more than 200 of Australia's top dealers so now it's even easier for you to get your hands on a Citizen printer. So to make your lasting impression, call Datronics now for the name of your nearest participating retailer.

CITIZEN[®] PRINTERS

AVAILABLE FROM LEADING DEALERS

AND SUPPORTED BY



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CM294

Printer survey

Daisy wheel printers

Make	Model	Serial interface	Parallel interface	Speed (chars/speed)	Max paper width (in)	Min pitch (cpi)	Max pitch (cpi)	Max chars per line	Buffer size	Tractor feed	Friction feed	Sheet feed	Bi-direct print head	Bi-direct paper feed	Config kypd on pntr	Print head type
BROTHER	HR-20	Y	Y	20	14.5	-	-	175	8	N	Y	N	Y	Y	Y	DAISY
BROTHER	HR-40	Y	Y	33	16.6	-	-	204	8	Y	Y	Y	Y	Y	Y	DAISY
BROTHER	TWINRITER 6	N	Y	36	16.5	-	-	203	3	N	Y	N	Y	Y	Y	DAISY/DOT
CITIZEN	PREMIERE-35	Y	Y	35	15	-	-	132	8	Y	Y	Y	Y	Y	Y	DAISY
DATAMATE	DWP2500	N	Y	20	11	-	-	165	2	N	Y	N	Y	Y	N	DAISYWHEEL
FUJITSU	SP320-Q	N	Y	48	16	-	-	163	-	N	Y	Y	Y	N	N	DAISY
QUME	LETTERPRO 20	Y	Y	22	13	-	-	165	8	Y	Y	Y	Y	Y	Y	DAISY
QUME	LETTERPRO PLUS	Y	Y	45	13	-	-	165	8	Y	Y	Y	Y	Y	Y	DAISY
QUME	SPRINT 11/40 PLUS	Y	Y	40	15	-	-	198	8	Y	Y	Y	Y	Y	Y	DAISY
QUME	SPRINT 11/40 WIDE	Y	Y	50	22	-	-	293	8	Y	Y	Y	Y	Y	Y	DAISY
QUME	SPRINT 11/55 PLUS	Y	Y	55	15	-	-	198	8	Y	Y	Y	Y	Y	Y	DAISY
QUME	SPRINT 11/90 PLUS	Y	Y	90	15	-	-	198	8	Y	Y	Y	Y	Y	Y	DAISY
TANDY	DWP 230	Y	Y	20	11*15	-	-	132	2	Y	Y	N	Y	Y	Y	-
TANDY	DWP 520	N	Y	43	11*15	-	-	132	2	Y	Y	N	-	-	Y	-

This survey of a large cross-section of computer printers was compiled from a disk-based questionnaire circulated to printer manufacturers, importers and distributors. As you'll see, it's extensive — the total of two hundred and forty printers exceeded our expectations. So extensive, in fact, that a review of the state of laser printer technology has been held over to next month's issue.

Remember that the prices listed here are recommended retail prices. You may be able to better these prices by shopping around.

Daisy wheel printers

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
57dB	365	132(H)x470(W)x344(D)	8	OPTIONAL CUT SHEET AND TRACTOR FEEDERS	\$999	BROTHER INDUSTRIES (AUST)	02 887 4344
55dB	365	196(H)x588(W)x337(D)	15	PAPER PARKING, RED PRINT, OPT. 2 BIN FEEDER	\$1695	BROTHER INDUSTRIES (AUST)	02 887 4344
60dB	365	200(H)x590(W)x381(D)	17	FULL IBM CHAR SET, GRAPHICS, DRAFT PRINT	\$2495	BROTHER INDUSTRIES (AUST)	02 887 4344
60dB	180	157(H)x636(W)x382(D)	13	INBUILT CLOCK	\$1792	DATRONICS CORP	887 9333
58dB	90	140(H)x330(W)x475(D)	7	-	\$799	DICK SMITH ELECTRONICS	02 888 3200
55dB	365	160(H)x550(W)x380(D)	17	FULL WORD PROCESSING FUNCTIONS	\$2028 EX TAX	FUJITSU AUSTRALIA LTD	02 959 6544
59dB	90	190(H)x520(W)x360(D)	-	3 PLUG IN PERSONALITieS.	\$1499	COMMUNICATIONS & PERIPHERALS	02 427 4222
59dB	90	190(H)x520(W)x360(D)	13	3 PLUG IN PERSONALITieS	\$1699	COMMUNICATIONS & PERIPHERALS	02 427 4222
62dB	90	181(H)x620(W)x377(D)	17	6 PLUG IN PERSONALITieS	\$3160	COMMUNICATIONS & PERIPHERALS	02 427 4222
60dB	90	178(H)x610(W)x371(D)	22	4 PLUG IN PERSONALITieS	\$4060	COMMUNICATIONS & PERIPHERALS	02 427 4222
62dB	90	181(H)x620(W)x377(D)	17	6 PLUG IN PERSONALITieS	\$3930	COMMUNICATIONS & PERIPHERALS	02 427 4222
60dB	90	181(H)x620(W)x377(D)	17	5 PLUG IN EMULATIONS	\$4950	COMMUNICATIONS & PERIPHERALS	02 427 4222
-	90	16(H)x61(W)x30(D)	12	IBM COMPATIBLE - AUTOMATIC IMPACT CONTROL	\$899	INTERTAN AUSTRALIA LTD	02 675 1222
-	90	20(H)x62(W)x39(D)	12	UNIDIRECTIONAL - IBM COMPATIBLE	\$1899	INTERTAN AUSTRALIA LTD	02 675 1222

Line printers

Make	Model	Serial interface	Parallel interface	Speed (lines/sec)	Max paper width (in)	Buffer size	Max chars per line	Config kypd on prntr	Col one cntrl chars	Print mech type
C.ITOH	CI-300	Y	Y	300	16	2	220	Y	Y	SHUTTLE
C.ITOH	CI-600	Y	Y	600	16	2	220	Y	Y	SHUTTLE
CENTRONICS	E SERIES	Y	Y	2000	16.25	-	136	-	Y	BAND
CENTRONICS	LW 1255	Y	Y	1200	18	-	132	-	Y	BAND
CENTRONICS	LW 400	Y	Y	400	18	-	132	-	Y	BAND
CENTRONICS	LW 800	Y	Y	800	18	-	132	-	Y	BAND
GENICOM	4410 SHUTTLE MATRIX	Y	Y	400	16.54	2	-	Y	Y	SHUTTLE
GENICOM	4440 SHUTTLE MATRIX	Y	Y	800	16.54	2	-	Y	Y	SHUTTLE
GENICOM	4470 SHUTTLE MATRIX	Y	Y	1200	16.54	-	-	Y	Y	SHUTTLE
GENICOM	4490 SHUTTLE MATRIX	Y	Y	1400	16.54	-	-	Y	Y	SHUTTLE
MANNESMANN TALLY	MT660	Y	Y	600	4-16	8	198	Y	Y	DOT MATRIX
MANNESMANN TALLY	MT690	Y	Y	900	4-16	8	198	Y	Y	DOT MATRIX

Plotters

Make	Model	Serial interface	Parallel interface	Speed (inches/sec)	Max paper width (in)	Buffer size	Config kypd on plott	Fiat bed plotter	Automatic paper feed	Auto pen capping	HP-GL compatible	Min number of pens	Max number of pens	Pen types supported
BRUNING	ZETA 8	Y	N	25	11	18	Y	N	Y	Y	Y	1	8	Liq. Ink,Liq. Roller,Nylon Tip,Ballpoint
BRUNING	ZETADRAF 900	Y	N	45	37.5	40	Y	N	N	Y	Y	1	8	Nylon Tip,Liquid Roller,Disp.Liquid Ink

Line printers

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
65dB	365	330(H)x660(W)x610(D)	53	85 LPM NLQ, DOT GRAPHICS, BARCODES	\$9744	ANITECH	02 648 1711
58dB	365	365(H)x720(W)x681(D)	85	NLQ 170 LPM, DOT GRAPHICS, BARCODES	\$18275	ANITECH	02 648 1711
-	365	---	227	-	NA	GENICOM (AUSTRALIA) PTY LTD	02 406 6411
-	365	740(H)x840(W)x990(D)	350	-	\$22141	GENICOM (AUSTRALIA) PTY LTD	02 406 6411
-	365	740(H)x690(W)x910(D)	109	-	\$14577	GENICOM (AUSTRALIA) PTY LTD	02 406 6411
-	365	740(H)x690(W)x910(D)	118	-	\$17402	GENICOM (AUSTRALIA) PTY LTD	02 406 6411
-	365	737(H)x635(W)x994(D)	285	GRAPHICS, BARCODES, IBM COAX/TWINAX	\$17539	IMPACT DATASCAPE, C & PA	-
-	365	737(H)x635(W)x994(D)	285	GRAPHICS, BARCODES, IBM COAX/TWINAX	\$20197	IMPACT DATASCAPE, C & PA	-
-	365	---	-	-	NA	GENICOM (AUSTRALIA) PTY LTD	02 406 6411
-	365	---	-	-	NA	GENICOM (AUSTRALIA) PTY LTD	02 406 6411
60dB	90	978(H)x851(W)x571(D)	158	HI-RES GRAPHICS/B-CODES & OCR STANDARD	\$17447	MICROPROCESSOR APPLICATIONS	03 894 1500
60dB	90	978(H)x851(W)x571(D)	158	HI-RES GRAPHICS/B-CODE & OCR STANDARD	\$28457	MICROPROCESSOR APPLICATIONS	03 894 1500

Plotters

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
-	90	254(H)x610(W)x305(D)	15	-	\$9995	KENELEC PTY LTD	03 560 1011
60dB	90	---	60	-	\$18900	KENELEC PTY LTD	03 560 1011

Plotters

Make	Model	Serial interface	Parallel interface	Speed (inches/sec)	Max paper width (in)	Buffer size	Config kypd on plotttr	Flat bed plotter	Automatic paper feed	Auto pen capping	HP-GL compatible	Min number of pens	Max number of pens	Pen types supported
ENTER	SP-1000	Y	N	24	24	18	Y	N	N	N	Y	1	1	Fiber Tip, Rollerball, Ceramic Tip, Liq. Ink
ENTER	SP-601	Y	Y	14	11	1	N	N	N	Y	Y	1	6	Fiber Tip, Liquid Roller.
HEWLETT-PACKARD	COLORPRO	Y	Y	16	8.5	1	N	N	N	Y	Y	1	8	Paper, Transparency
HEWLETT-PACKARD	DRAFTMASTER	Y	Y	24	36	25	Y	N	N	Y	Y	1	8	Paper, Trans, Roller-Ball, Drafting
HEWLETT-PACKARD	DRAFTPRO	Y	Y	16	25	8	Y	N	N	Y	Y	1	8	Paper, Trans, Roller-Ball, Drafting
HEWLETT-PACKARD	HP7475A	Y	Y	15	11	1	N	N	N	Y	Y	1	6	Paper, Transparency, Drafting
HEWLETT-PACKARD	HP7550A	Y	Y	32	11	12	Y	N	Y	Y	Y	1	8	Paper, Transp, Roller-Ball, Drafting
ROLAND DG	DPX-2200	Y	Y	18	A2	15	Y	Y	N	Y	Y	1	8	Roland, Staedtler, Hp, Rotring
ROLAND DG	DPX-3300	Y	Y	18	A1	15	Y	Y	N	Y	Y	1	8	Roland, Staedtler, Hp, Rotring
ROLAND DG	DXY-800	Y	Y	5	A3	-	Y	Y	N	N	N	1	8	Roland, Staedtler, Hp, Rotring
ROLAND DG	DXY-880	Y	Y	8	A3	3	Y	Y	N	N	Y	1	8	Roland, Staedtler, Rotring, Hp
ROLAND DG	DXY-885	Y	Y	12	A3	1	Y	Y	N	Y	Y	1	8	Roland, Staedtler, Hp, Rotring
ROLAND DG	DXY-980	Y	Y	9	A3	3	Y	Y	N	N	Y	1	8	Roland, Staedtler, Hp, Rotring
ROLAND DG	DXY-990	Y	Y	12	A3	1	Y	Y	N	Y	Y	1	8	Roland, Staedtler, Hp, Rotring
SEKONIC	SPL-410	Y	Y	12	17	2	Y	Y	N	N	Y	6	6	Aqueous, Oily
SEKONIC	SPL-430	Y	Y	22	17	2	Y	Y	N	Y	Y	6	6	Aqueous, Oily
SEKONIC	SPL-800	Y	N	18	24	18	Y	Y	N	Y	Y	8	8	Aqueous, Oily, Ball Point, Ceramic

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
-	90	216(H)x991(W)x203(D)	20	-	\$7590	KENELEC PTY. LTD.	03 560 1011
-	90	81(H)x457(W)x292(D)	4	-	\$1650	KENELEC PTY. LTD.	03 560 1011
-	365	125(H)x460(W)x308(D)	5	-	\$2824	Hewlett Packard	03 895 2895
-	90	--508(D)	73	OPT. ROLL FEED AVAILABLE(DRAFTMASTER II)	\$21597	Hewlett Packard	03 895 2895
-	90	--520(D)	30	PEN SORTING	\$ 11740	Hewlett Packard	03 895 2895
-	365	127(H)x568(W)x367(D)	7	-	\$4142	Hewlett Packard	03 895 2895
-	365	215(H)x670(W)x432(D)	17	MAX ACCELERATION OF 6 G'S	\$8528	Hewlett Packard	030 895 2895
-	365	692(H)x900(W)x175(D)	26	PROG.SPEED & PRESSURE,LEDD,ELECTRO PAD	\$7495	ROLAND CORP AUST P/L	03 241 1254
-	365	852(H)x-175(D)	40	PROG.SPEED& PRESSURE,LEDD,ELECTRO PAD	\$11495	ROLAND CORP AUST P/L	03 241 1254
-	365	77(H)x496(W)x435(D)	5	-	\$1495	ROLAND CORP AUST P/L	03 241 1254
-	365	90(H)x533(W)x430(D)	5	OPTIONAL 10K BUFFER	\$2250	ROLAND CORP AUST P/L	03 241 1254
-	365	102(H)x586(W)x436(D)	6	MAGNETIC BASE,ADJUSTABLE PEN PRESSURE	\$2850	ROLAND CORP AUST P/L	03 241 1254
-	365	106(H)x535(W)x450(D)	5	LED DISPLAY,ELECTROSTATIC PAPER HOLD	\$2950	ROLAND CORP AUST P/L	03 241 1254
-	365	115(H)x608(W)x452(D)	7	LED DISPLAY,PRESSURE ADJ.,ELECTOST PAD	\$3595	ROLAND CORP AUST P/L	03 241 1254
-	365	105(H)x575(W)x448(D)	10	RESOLUTION 0.025 MM	POA	ANITECH	02 648 1711
-	365	110(H)x489(W)x302(D)	6	RESOLUTION 0.025 MM	POA	ANITECH	02 648 1711
-	365	999(H)x820(W)x320(D)	32	RESOLUTION 0.025 MM	POA	ANITECH	02 648 1711

Inkjet printers

Make	Model	Serial interface	Parallel interface	Draft speed (cps)	NLQ mode	NLQ speed (cps)	Max paper width (in)	Plain paper	Min pitch (cpi)	Maximum pitch (cpi)	Max chars per line	Bi-direct print head	Bi-direct paper feed	Max graphics (dpi)	Buffer size	Tractor feed	Friction feed	Sheet feed	Proportnl print mode	D/loadable char set	IBM graphics compat	Epson model compat
EPSON	IX-800	Y	Y	240	Y	54	10	Y	-	-	160	Y	N	240	8	N	Y	Y	Y	Y	Y	LX/ FX/ EX
EPSON	SQ-2500	Y	Y	540	Y	180	16	Y	-	-	272	Y	N	360	8	Y	Y	Y	Y	Y	Y	LQ SERIES
HEWLETT-PACKARD	QUIETJET	Y	Y	192	Y	48	9.75	N	-	-	170	N	N	192	2	Y	Y	N	N	N	Y	MX80
HEWLETT-PACKARD	QUIETJET PLUS	Y	Y	192	Y	48	15	N	-	-	281	Y	Y	192	2	Y	Y	Y	N	N	Y	MX80
MANNESMANN TALLY	MT90	Y	Y	220	Y	110	4-10	Y	-	-	132	Y	Y	240	3	Y	Y	Y	N	Y	Y	FX

Laser printers

Make	Model	Serial interface	Parallel interface	Resolution (dpi)	Speed (pages/min)	Memory standard	Memory maximum	Point size minimum	Point size maximum	Downloadable fonts	Plug-in fonts	Num standard fonts	Number of trays	Feeder tray pages	Output tray pages	Collation order	Config kypd on pntr	Rec. pages/month	Doc description lang.
C.ITOH	CIE3000	N	Y	300	30	4096	6144	6	12	Y	Y	16	3	500	500	Y	Y	-	VECTOR DRAWING
C.ITOH	LIPS 10	Y	Y	300	10	512	1200	6	12	Y	Y	9	2	250	250	Y	Y	15000	LIPS CONTROL LANG.
CENTRONICS	PAGEPRINTER 8	Y	Y	300	8	-	-	-	-	-	Y	10	1	100	100	-	-	-	-
COMMODORE	LP 806	N	Y	300	6	256	650	1	300	Y	Y	15	1	150	150	Y	Y	3000	HP PLUS
DATAPRODUCTS CORP.	LZR 1230	Y	Y	300	12	512	2000	-	-	Y	Y	6	1	250	250	Y	Y	10000	LASERJET+
DATASOUTH	PAGE-WRITER 8	Y	Y	300	8	512	1200	2	50	Y	Y	4	2	250	250	Y	Y	5000	PRINTER EMULATOR
EPSON	GQ-3500	N	Y	300	6	512	2048	7	24	Y	Y	7	1	150	250	Y	Y	3000	ESC/PL
FACIT	P7010	Y	Y	300	8	256	512	-	-	Y	Y	4	1	250	250	Y	N	10000	N
FACIT	P7080	Y	Y	300	8	512	2000	-	-	Y	Y	3	1	250	250	Y	Y	10000	OPTIONAL

Inkjet printers

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
54dB	365	103(H)x485(W)x302(D)	6	IBM EMULATION, OPTIONAL TRACTOR FEED	\$1450	EPSON AUSTRALIA PTY LIMITED	02 452 5222
45dB	365	135(H)x618(W)x380(D)	11	SELF CLEAN,AUTO LOAD,MULTI FONTS,OP DBSF	\$2540	EPSON AUSTRALIA PTY LIMITED	02 452 5222
48dB	365	118(H)x395(W)x214(D)	4	BOLD,COMPRESSED,EXPANDED PRINT MODES	\$1229	Hewlett Packard	03 895 2895
48dB	365	118(H)x527(W)x214(D)	4	COMPRESSED,EXPANDED,BOLD PRINT	\$1739	Hewlett Packard	03 895 2895
45dB	90	11(H)x40(W)x29(D)	6	PUSH TRACTORS/PAPER ROLL/24 NOZZLE B/JET	\$1759	MICROPROCESSOR APPLICATIONS	03 894 1500

Laser printers

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
58dB	365	610(H)x685(W)x585(D)	81	150,000 PAGES PER MONTH DUTY CYCLE	\$49950	ANITECH	02 648 1711
55dB	365	285(H)x520(W)x490(D)	35	600,000 PAGE LIFE, BAR-CODES, 4 EMULATION	\$7950	ANITECH	02 648 1711
	365	292(H)x442(W)x450(D)	32	PRICE INCLUDES HP LASERJET PLUS	\$ 3995	GENICOM (AUSTRALIA) PTY LTD	02 406 6411
45dB	90	205(H)x417(W)x407(D)	15	EMULATES MOST STD. PRINTERS DIABLO/EPSON	\$3999	COMMODORE BUSINESS MACHINES	02 427 4888
55dB	365	321(H)x479(W)x493(D)	38	DIABLO 630,FX80,3* CONCURRENT INTERFACES	\$7780	DATAPRODUCTS CORP	02 451 3533
45dB	90	276(H)x470(W)x525(D)	24		\$4500	KENELEC PTY LTD	03 560 1011
52dB	365	405(H)x591(W)x215(D)	16	FONT CARDS,OPT 250 INPUT TRAY,SER I/F	\$4500	EPSON AUSTRALIA PTY LIMITED	02 452 5222
55dB	90	329(H)x530(W)x420(D)	40	DIABLO 630	\$7200	ELMEASCO INSTRUMENTS	02 427 3322
55dB	90	550(H)x470(W)x410(D)	40	DIABLO 630, IBM PRO, H.P. LASERJET	\$9672	ELMEASCO INSTRUMENTS	02 427 3322

Laser printers

Make	Model	Serial interface	Parallel interface	Resolution (dpi)	Speed (pages/min)	Memory standard	Memory maximum	Point size minimum	Point size maximum	Downloadable fonts	Plug-in fonts	Num standard fonts	Number of trays	Feeder tray pages	Output tray pages	Collation order	Config kypd on pntr	Rec. pages/month	Doc description lang.
FACIT	P7150	Y	Y	300	15	512	2000	-	-	Y	Y	3	2	250	250	Y	Y	20000	OPTIONAL
GENICOM	5010	Y	Y	300	10	-	-	-	-	Y	Y	64	2	250	250	Y	-	-	-
HEWLETT-PACKARD	LASERJET 2000	Y	Y	300	20	1500	5500	6	655	Y	Y	34	2	250	1500	Y	Y	70000	PCL
HEWLETT-PACKARD	LASERJET 500	Y	Y	300	8	512	2512	6	30	Y	Y	4	2	250	250	Y	Y	4000	PCL
HEWLETT-PACKARD	LASERJET II	Y	Y	300	8	512	4512	6	655	Y	Y	6	1	200	100	Y	Y	5000	POSTSCRIPT AVAIL-OCT
IMPACT	L1500-01	Y	Y	300	15	768	-	6	36	Y	Y	4	2	250	500	Y	Y	25000	-
IMPACT	L1500-02	Y	Y	300	15	3576	-	6	36	Y	Y	4	2	250	500	Y	Y	25000	POSTSCRIPT
IMPACT	L2000-01	Y	Y	300	20	2500	-	6	-	Y	Y	4	2	250	500	Y	Y	-	-
IMPACT	L2000-02	Y	Y	300	20	2500	-	6	-	Y	Y	-	2	250	500	Y	Y	-	IMPACT GCL
IMPACT	L2000-03	Y	Y	300	20	2500	-	6	-	Y	Y	-	2	250	500	Y	Y	-	POSTSCRIPT
IMPACT	L800-C	Y	Y	300	8	384	4500	6	24	Y	Y	4	1	200	120	Y	Y	6000	IMPACT LCL
IMPACT	L800-C4	Y	Y	300	8	2200	4500	6	24	Y	Y	4	1	100	50	Y	Y	6000	IMPACT GCL
IMPACT	L800-T	Y	Y	300	8	640	4500	6	24	Y	Y	4	1	100	50	Y	Y	6000	IMPACT LCL
IMPACT	L800-T4	Y	Y	300	8	2200	4500	6	24	Y	Y	7	1	100	50	Y	Y	6000	IMPACT GCL
IMPACT	L800-W	Y	Y	300	8	384	4500	6	24	Y	Y	6	1	100	50	Y	Y	6000	IMPACT LCL
IMPACT	LP800-01	Y	Y	300	8	2000	4500	6	-	Y	Y	4	1	100	50	Y	Y	6000	POSTSCRIPT
IMPACT	LS400-01	Y	Y	300	4	256	4500	6	24	Y	Y	2	1	200	120	Y	Y	4000	IMPACT LCL

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
55dB	90	550(H)x470(W)x410(D)	40	DIABLO 630, IBM PRO, H.P. LASERJET	\$13600	ELMEASCO INSTRUMENTS	02 427 3322
-	365	386(H)x450(W)x495(D)	38	PRICE INCLUDES HP LASERJET PLUS	\$ 5995	GENICOM (AUSTRALIA) PTY. LTD.	02 406 6411
57dB	90		163	DOUBLE-SIDED, GRAPHICS, 2000 INPUT DECK	\$ 43626	Hewlett-Packard	03 895 2895
55dB	365	460(H)x475(W)x495(D)	43	JOB OFFSETTING, GRAPHICS, FORM OVERLAY	\$ 10189	HP	03 895 2895
50dB	365	228(H)x454(W)x482(D)	22	GRAPHICS, FORM OVERLAYS	\$5958	HP	03 895 2895
-	90	445(H)x546(W)x724(D)	40	3 PRINTER EMULATIONS	\$11195	IMPACT SYSTEMS LIMITED	02 969 2699
-	90	445(H)x546(W)x724(D)	40	4 PRINTER EMULATIONS	\$16240	IMPACT SYSTEMS LIMITED	02 969 2699
57dB	90	965(H)x730(W)x600(D)	100	DYNAMIC MEMORY MGMT, PLUG IN EMULATIONS	\$29680	IMPACT SYSTEMS LIMITED	02 969 2699
57dB	90	965(H)x730(W)x600(D)	100	GRAPHICS, BAR CODES, A3 PAPER, DUPLEX	\$36588	IMPACT SYSTEMS LIMITED	02 969 2699
57dB	90	965(H)x730(W)x600(D)	100	DYNAMIC MEMORY MGMT, PLUG IN EMULATIONS	\$43316	IMPACT SYSTEMS LIMITED	02 969 2699
50dB	90	293(H)x475(W)x415(D)	32	IBM 3174/3274/3276 (INTEGRATED COAX)	\$8955	IMPACT SYSTEMS LIMITED	02 969 2699
50dB	90	293(H)x475(W)x415(D)	32	IBM 3174/3274/3276 (INTEGRATED COAX)	\$10300	IMPACT SYSTEMS LIMITED	02 969 2699
50dB	90	293(H)x475(W)x415(D)	32	IBM 34/36/38 (INTEGRATED TWINAX I/FACE)	\$8955	IMPACT SYSTEMS LIMITED	02 969 2699
50dB	90	293(H)x475(W)x415(D)	32	IBM 34/36/38, GRAPHICS, BAR CODES, OCR	\$10300	IMPACT SYSTEMS LIMITED	02 969 2699
50dB	90	293(H)x475(W)x415(D)	32	WANG VS/OIS, WANG 5573, 5574 EMULATIONS	\$8235	IMPACT SYSTEMS LIMITED	02 969 2699
50dB	90	293(H)x475(W)x415(D)	32	-	\$10794	IMPACT SYSTEMS LIMITED	02 969 2699
50dB	90	263(H)x454(W)x482(D)	20	DIABLO 630 EMULATION	\$3495	IMPACT SYSTEMS LIMITED	02 969 2699

Laser printers

Make	Model	Serial interface	Parallel interface	Resolution (dpi)	Speed (pages/min)	Memory standard	Memory maximum	Point size minimum	Point size maximum	Downloadable fonts	Plug-in fonts	Num standard fonts	Number of trays	Feeder tray pages	Output tray pages	Collation order	Config kypd on pntr	Rec. pages/month	Doc description lang.
IMPACT	LS800-02	Y	Y	300	8	384	4500	6	24	Y	Y	7	1	200	120	Y	Y	6000	IMPACT LCL
IMPACT	LS800-03	Y	Y	300	8	2200	4500	6	24	Y	Y	9	1	200	120	Y	Y	6000	IMPACT GCL
IMPACT	LS800-04	Y	Y	300	8	2200	4500	6	24	Y	Y	11	1	200	120	Y	Y	6000	IMPACT GCL
IMPACT	LS800-1	Y	Y	300	8	256	4500	6	24	Y	Y	2	1	200	120	Y	Y	6000	IMPACT LCL
IMPACT	LS800-D1	Y	Y	300	8	256	4500	6	24	Y	Y	4	1	200	120	Y	Y	6000	IMPACT LCL
IMPACT	LS800-D2	Y	Y	300	8	384	4500	6	24	Y	Y	6	1	200	120	Y	Y	6000	IMPACT LCL
MANNESMANN TALLY	MT 910	Y	Y	300	10	512	2000	6	30	Y	Y	3	2	500	500	Y	Y	10000	NONE AS YET
OASYS LASER-PRO	1510	Y	Y	300	15	768	1200	2	50	Y	Y	22	2	500	500	Y	Y	15000	PYRAMID,LASER PROSE.
OASYS LASER-PRO	EXPRESS	Y	Y	300	8	512	512	2	50	Y	Y	19	1	250	250	Y	Y	5000	PRINTER EMULATOR
OASYS LASER-PRO	EXPRESS SERIES 2	Y	Y	300	8	640	640	2	50	Y	Y	19	1	250	250	Y	Y	5000	PRINTER EMULATION
OASYS LASER-PRO	GOLD EXPRESS	Y	Y	300	8	1500	3000	2	50	Y	Y	25	1	250	250	Y	Y	5000	EXPRESS & PYRAMID
OASYS LASER-PRO	SILVER EXPRESS	Y	Y	300	8	768	1200	2	50	Y	Y	25	1	250	250	Y	Y	5000	EXPRESS & PYRAMID
OKI MICROLINE	LASERLINE 6	Y	Y	300	6	128	512	8	14	Y	Y	15	1	150	150	Y	Y	3000	PAGE-MAKER
OMNI LASER	2015	Y	Y	300	15	512	512	-	-	Y	Y	1	2	250	500	Y	Y	25000	NO
OMNI LASER	2108	Y	Y	300	8	2048	2048	-	-	Y	Y	4	1	250	250	Y	Y	8000	POSTSCRIPT
OMNI LASER	2115	Y	Y	300	15	3072	3072	-	-	Y	Y	4	2	250	500	Y	Y	25000	POSTSCRIPT
QUADLASER	LS2000	N	Y	300	8	1500	2000	6	36	Y	N	8	1	250	250	Y	N	10000	POSTSCRIPT

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
50dB	90	263(H)x454(W)x482(D)	20	6 PRINTER EMULATIONS	\$5320	IMPACT SYSTEMS LIMITED	02 969 2699
50dB	90	263(H)x454(W)x482(D)	20	6 PRINTER EMULATIONS WITH LASERJET PLUS	\$6664	IMPACT SYSTEMS LIMITED	02 969 2699
50dB	90	263(H)x454(W)x482(D)	20	6 PTRS,GRAPHICS,23 BAR CODES,HP 7470A	\$8955	IMPACT SYSTEMS LIMITED	02 969 2699
50dB	90	263(H)x454(W)x482(D)	20	DIABLO 630 EMULATION	\$3995	IMPACT SYSTEMS LIMITED	02 969 2699
50dB	90	263(H)x454(W)x482(D)	20	DECMATE COMPATIBLE, HP LASERJET	\$7112	IMPACT SYSTEMS LIMITED	02 969 2699
50dB	90	263(H)x454(W)x482(D)	20	DECMATE COMPATIBLE, HP LASERJET	\$7505	IMPACT SYSTEMS LIMITED	02 969 2699
50dB	90	360(H)x464(W)x450(D)	32	5 EMULAT.STAND-OPT 4 PORT IF/2 MB MEMORY	\$8720	MICROPROCESSOR APPLICATIONS Pty Ltd	03 894 1500
55dB	90	400(H)x537(W)x462(D)	40	-	\$12100	KENELEC PTY LTD	03 560 1011
55dB	90	300(H)x405(W)x388(D)	22	HP LASER JET CARTRIDGE OPTION	\$3670	KENELEC PTY LTD	03 560 1011
55dB	90	300(H)x405(W)x388(D)	22	-	\$3840	KENELEC PTY LTD	03 560 1011
55dB	90	300(H)x405(W)x388(D)	22	H.P FONT CARTRIDGE,HPGL COMPATIBLE.	\$6370	KENELEC PTY LTD	03 560 1011
55dB	90	300(H)x405(W)x388(D)	22	H.P FONT CARTRIDGE.	\$4850	KENELEC PTY LTD	03 560 1011
52dB	365	225(H)x414(W)x410(D)	17	3-PORT HP+ EMULATION 550 SHEET DUAL BIN	\$4482	IPL DATRON PTY LTD	02 698 8211
55dB	90	444(H)x546(W)x724(D)	40	1.5M COPIES LIFE TIME, PAPER JOGGER	\$11500	TEXAS INSTRUMENTS AUSTRALIA LTD	02 887 1122
55dB	90	394(H)x546(W)x597(D)	35	600K MACHINE LIFE, AP-LETALK, RS422 I/F	\$11500	TEXAS INSTRUMENTS AUSTRALIA LTD	02 887 1122
55dB	90	444(H)x546(W)x724(D)	40	1.5M MACHINE LIFE, AP-LETALK, RS422 I/F	\$16675	TEXAS INSTRUMENTS AUSTRALIA LTD	02 887 1122
55dB	90	330(H)x510(W)x580(D)	37	FORMS SOFTWARE, FONT EDITOR,600000 COPIES	\$6995	INTELLIGENT SYSTEMS AUST PTY LTD	03 543 7988

Laser printers

Make	Model	Serial interface	Parallel interface	Resolution (dpi)	Speed (pages/min)	Memory standard	Memory maximum	Point size minimum	Point size maximum	Downloadable fonts	Plug-in fonts	Num standard fonts	Number of trays	Feeder tray pages	Output tray pages	Collation order	Config kypd on pntr	Rec. pages/month	Doc description lang.
QUADLASER	LS2001	Y	N	300	8	1500	2000	6	36	Y	N	8	1	250	250	Y	N	10000	POSTSCRIPT
QUADLASER	LS2200	N	Y	300	8	2000	2000	6	36	Y	N	8	1	250	250	Y	N	10000	POSTSCRIPT
QUADLASER	LS2201	Y	N	300	8	2000	2000	6	36	Y	N	8	1	250	250	Y	N	10000	POSTSCRIPT
QUME	LASERTEN	Y	Y	300	10	128	128	7	36	Y	Y	1	1	250	250	Y	N	5000	-
QUME	LASERTEN PLUS	Y	Y	300	10	512	512	7	36	Y	Y	1	1	250	250	Y	N	5000	-
QUME	SCRIPTEN	Y	Y	300	10	2000	3000	2	127	Y	Y	35	1	250	250	Y	N	5000	POSTSCRIPT
RANK XEROX	2700	Y	Y	300	12	512	512	6	24	Y	Y	2	2	250	250	Y	N	30000	-
RANK XEROX	3700	Y	Y	300	24	1000	2000	6	32	Y	Y	2	3	-	-	Y	N	-	-
RANK XEROX	4045	Y	Y	300	10	1000	2000	6	36	Y	Y	2	1	250	100	Y	N	12000	-
THE LASER CONNECTION	PS-JET+	Y	N	300	8	2000	-	1	999	Y	N	13	1	-	-	-	Y	-	POSTSCRIPT
UNISYS	MODEL 37	Y	Y	300	10	1000	1000	2	50	Y	N	61	1	250	150	N	N	5000	EXPRESS
UNISYS	MODEL 37	Y	Y	300	10	1000	1000	2	50	Y	N	61	1	250	150	N	N	5000	EXPRESS
WENGER	26/1X SERIES	Y	Y	300	26	-	-	-	-	Y	-	8	2	500	500	Y	Y	30000	POSTSCRIPT
WENGER	8/1	Y	Y	300	8	1500	2000	-	-	Y	Y	4	1	250	250	Y	Y	10000	-

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
55dB	90	330(H)x510(W)x580(D)	37	FORMS SOFTWARE, FONT EDITOR, 600000 COPIES	\$6995	INTELLIGENT SYSTEMS AUST Pty Ltd	03 543 7988
55dB	90	330(H)x510(W)x580(D)	37	FORMS SOFTWARE, FONT EDITOR, 600000 COPIES	\$7995	INTELLIGENT SYSTEMS AUST Pty Ltd	03 543 7988
55dB	90	330(H)x510(W)x580(D)	37	FORMS SOFTWARE, FONT EDITOR, 600000 COPIES	\$7995	INTELLIGENT SYSTEMS AUST Pty Ltd	03 543 7988
50dB	90	380(H)x440(W)x505(D)	38	6 PLUG IN PERSONALITYS	\$7342	COMMUNICATIONS & PERIPHERALS	02 427 4222
55dB	90	380(H)x440(W)x505(D)	44	6 PLUG IN PERSONALITYS	\$8070	COMMUNICATIONS & PERIPHERALS	02 427 4222
50dB	90	380(H)x440(W)x505(D)	39	APPLE/HP L JET/RS232/CENT	\$10794	COMMUNICATIONS & PERIPHERALS	02 427 4222
35dB	90	?-889(W)x787(D)	172	SNA BOARD	\$20000	RANK XEROX AUSTRALIA PTY LTD	02 449 0449
35dB	90	?-889(W)x787(D)	172	10 OR 50 MB HARD DISK, A3 PAPER SIZE	\$50000	RANK XEROX AUSTRALIA PTY LTD	02 449 0449
35dB	90	270(H)x700(W)x550(D)	65	COPIER INC OPTIONAL SNA	\$10000	RANK XEROX AUSTRALIA PTY LTD	02 449 0449
-	365		-	PSCRIPT UPGRADE FOR ALL CANON CX LASERS	\$8120	MEGAVISION PTY LTD	02 957 5797
45dB	90	340(H)x450(W)x440(D)	29	MULTIPLE PRINTER EMULATIONS	\$7286	UNISYS AUSTRALIA LTD	02 963 6000
45dB	90	340(H)x450(W)x440(D)	29	MULTIPLE PRINTER EMULATIONS	\$7286	UNISYS AUSTRALIA LTD	02 963 6000
55dB	90	408(H)x567(W)x895(D)	80	PAPER TRANSPORTED BY LONG OR SHORT EDGE	\$22441	DATATEL PTY LTD	03 690 4000
55dB	90	331(H)x407(W)x534(D)	37	FONT EDITOR TO ALTER OR CREATE FONTS	\$8810	DATATEL PTY LTD	03 690 4000

Dot matrix printers

Make	Model	Serial interface	Parallel interface	Draft speed (cps)	NLQ mode	NLQ speed (cps)	Max paper width (in)	Minimum pitch (cpi)	Maximum pitch (cpi)	Max chars per line	Bi-directnl prnt head	Bi-directnl paper feed	Num. print pins/wires	Max graphics (dpi)	Buffer size	Tractor feed	Friction feed	Sheet feed	Proportnl print mode	D/loadable char set	IBM graphics compat	Epson model compat
AMSTRAD	DMP2000	N	Y	105	Y	35	10	5	17	137	Y	N	9	120	8	Y	Y	N	Y	N	N	FX-80
AMSTRAD	DMP3160	N	Y	160	Y	40	10	17	5	132	Y	N	9	120	8	Y	Y	N	Y	Y	Y	FX-80
AMSTRAD	DMP4000	N	Y	200	Y	50	16.5	17	10	233	Y	Y	9	120	8	Y	Y	N	Y	Y	Y	FX-100
AMSTRAD	LQ3500	Y	Y	160	Y	54	10	17	5	136	Y	Y	24	240	7	Y	Y	Y	Y	Y	Y	LQ-1500
BROTHER	M-1109	Y	Y	100	Y	25	10	20	5	160	Y	Y	9	240	2	N	Y	N	Y	Y	Y	FX-80
BROTHER	M-1709	Y	Y	240	Y	50	16	20	5	272	Y	Y	9	240	24	Y	Y	N	Y	Y	Y	FX-100+
BROTHER	M-1724	Y	Y	216	Y	72	16	20	5	272	Y	Y	24	360	16	Y	Y	N	Y	Y	Y	LQ-1000
BROTHER	M-4018	Y	Y	480	Y	100	16	20	5	272	Y	Y	18	240	48	Y	Y	N	Y	Y	Y	EX-1000
C.ITOH	1550S+	Y	Y	180	Y	22	15	5	17	230	Y	Y	9	240	2	Y	Y	Y	Y	Y	Y	MX-80
C.ITOH	8510S+	Y	Y	180	Y	22	10	5	17	136	Y	Y	9	240	2	Y	Y	Y	Y	Y	Y	MX-80
C.ITOH	C310	Y	Y	300	Y	50	11	9	18	160	Y	Y	9	240	8	Y	Y	Y	Y	Y	Y	FX-85
C.ITOH	C315	Y	Y	300	Y	50	15.5	9	18	272	Y	Y	9	240	8	Y	Y	Y	Y	Y	Y	FX-105
C.ITOH	C715	Y	Y	300	Y	100	16	9	18	272	Y	Y	24	360	32	Y	Y	Y	Y	Y	Y	LQ 1500
C.ITOH	C815	Y	Y	570	Y	162	16	5	18	232	Y	Y	24	360	42	Y	Y	Y	Y	Y	Y	MX-80
C.ITOH	CI-3500	Y	Y	350	Y	87	16	6	18	233	Y	Y	9	240	2	Y	Y	Y	Y	Y	Y	MX-80
C.ITOH	RITEMAN 15	Y	Y	160	Y	30	15	5	17	233	Y	Y	9	125	2	Y	Y	Y	Y	Y	Y	FX-100
C.ITOH	RITEMAN A2	Y	Y	160	Y	30	9.5	5	17	132	Y	Y	9	144	2	N	Y	Y	Y	Y	Y	FX-80

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
-	90	100(H)x380(W)x260(D)	4	SUPPLIED WITH CABLE FOR AMSTRAD CPC	\$599	MITSUBISHI ELECTRIC AWA	02 638 8444
-	90	100(H)x400(W)x250(D)	4	-	\$599	MITSUBISHI ELECTRIC AWA	02 638 8444
-	90	120(H)x600(W)x350(D)	9	-	\$799	MITSUBISHI ELECTRIC AWA	02 638 8444
-	90	85(H)x424(W)x332(D)	5	AVAILABLE IN DECEMBER	\$799	MITSUBISHI ELECTRIC AWA	02 638 8444
60dB	365	70(H)x334(W)x195(D)	4	OPTIONAL PIN FEED, OPTIONAL APPLE SPEC.	\$529	BROTHER INDUSTRIES (AUST) Pty Ltd	02 887 4344
55dB	365	99(H)x490(W)x305(D)	8	PAPER PARKING, OPTIONAL CUT SHEET FEEDER	\$1195	BROTHER INDUSTRIES (AUST) Pty Ltd	02 887 4344
58dB	365	123(H)x512(W)x305(D)	9	PAPER PARKING, OPTIONAL CUT SHEET FEEDER	\$1595	BROTHER INDUSTRIES (AUST) Pty Ltd	02 887 4344
57dB	365	175(H)x595(W)x402(D)	16	PAPER PARKING,AUTO LOADING,COLOUR PRINT.	\$3099	BROTHER INDUSTRIES (AUST) Pty Ltd	02 887 4344
62dB	365	145(H)x550(W)x314(D)	12	CLOSE TEAR OFF, OPTIONAL COLOUR	\$1449	ANITECH	02 648 1711
61dB	365	137(H)x420(W)x297(D)	9	CLOSE TEAR OFF, OPTIONAL COLOUR	\$1249	ANITECH	02 648 1711
55dB	365	128(H)x442(W)x346(D)	9	BOTTOM FEED, TEAR OFF, OPTIONAL COLOUR	\$1359	ANITECH	02 648 1711
55dB	365	143(H)x568(W)x346(D)	14	APPLE MAC COMPATIBLE, OPTIONAL COLOUR	\$1759	ANITECH	02 648 1711
56dB	365	132(H)x633(W)x374(D)	37	AUTO PAPER PARK & LOAD, OPTIONAL COLOUR	\$2550	ANITECH	02 648 1711
55dB	365	159(H)x580(W)x395(D)	15	BOTTOM FEED, DIAMOND ARRAY HEAD	\$3995	ANITECH	02 648 1711
58dB	365	120(H)x570(W)x420(D)	17	BOTTOM FEED, DEC LA100 VERSION	\$3620	ANITECH	02 648 1711
55dB	365	125(H)x595(W)x330(D)	9	PUSH/PULL TRACTORS, BOTTOM FEED, TEAR OFF	\$1339	ANITECH	02 648 1711
55dB	365	75(H)x350(W)x265(D)	5	PIN FEED, TEAR OFF	\$949	ANITECH	02 648 1711

Dot matrix printers

Make	Model	Serial interface	Parallel interface	Draft speed (cps)	NLQ mode	NLQ speed (cps)	Max paper width (in)	Minimum pitch (cpi)	Maximum pitch (cpi)	Max chars per line	Bi-directnl prnt head	Bi-directnl paper feed	Num. print pins/wires	Max graphics (dpi)	Buffer size	Tractor feed	Friction feed	Sheet feed	Proportnl print mode	D/loadable char set	IBM graphics compat	Epson model compat
C.ITOH	RITEMAN F+ III	Y	Y	160	Y	30	9.5	9	18	132	Y	Y	9	240	2	Y	Y	Y	Y	Y	Y	FX-80
CENTRONICS	350	Y	Y	200	Y	-	-	10	-	132	Y	Y	18	-	-	Y	Y	Y	-	-	-	-
CITIZEN	HQP-45	Y	Y	200	Y	66	15	8	16	136	Y	Y	24	-	24	Y	Y	Y	Y	Y	Y	LQ-1000
CITIZEN	LSP-120D	Y	Y	120	Y	25	10	8	16	80	Y	Y	9	-	4	Y	Y	N	Y	Y	Y	FX
CITIZEN	MSP-10	N	Y	160	Y	40	10	8	16	136	Y	Y	9	-	1	Y	Y	N	Y	Y	Y	FX
CITIZEN	MSP-15	N	Y	160	Y	40	15	8	16	136	Y	Y	9	-	1	Y	Y	Y	Y	Y	Y	FX
CITIZEN	MSP-20	Y	Y	200	Y	50	10	8	16	80	Y	Y	9	-	1	Y	Y	Y	Y	Y	Y	FX
CITIZEN	MSP-25	Y	Y	200	Y	50	15	8	16	136	Y	Y	9	-	1	Y	Y	Y	Y	Y	Y	FX
COMMODORE	MPS 1280	N	Y	120	Y	20	16	5	17	233	Y	N	9	144	2	Y	Y	N	Y	N	Y	IBM
COMMODORE	MPS 2020	N	Y	300	Y	100	8.5	5	17	132	Y	N	18	288	8	Y	Y	Y	Y	N	Y	-
DACOS	VP1814	Y	Y	180	Y	30	8.5	20	5	154	Y	Y	9	240	15	Y	Y	N	Y	Y	Y	LX-80
DATAMATE	DSE-135	N	Y	135	N	-	10	17	5	132	Y	N	9	240	8	Y	Y	N	N	Y	Y	FX-80
DATA-PRODUCTS CORP	8070+	Y	Y	400	Y	100	15.5	10	17	132	Y	Y	18	-	4	Y	Y	Y	Y	Y	Y	MX
DATA-PRODUCTS CORP	9030	N	Y	300	Y	33	11	10	17	80	Y	Y	9	240	2	Y	Y	Y	Y	Y	Y	FX86,FX286
DATA-PRODUCTS CORP	9034	Y	Y	300	Y	83	11	10	17	80	Y	Y	24	-	2	Y	Y	Y	Y	Y	Y	LQ800/1000
DATA-PRODUCTS CORP	9040	Y	Y	300	Y	33	15.5	10	17	132	Y	Y	9	240	2	Y	Y	Y	Y	Y	Y	FX86/286E
DATA-PRODUCTS CORP	9044	Y	Y	300	Y	83	15.5	10	17	132	Y	Y	24	-	2	Y	Y	Y	Y	Y	Y	LQ800/1000

Dot matrix printers

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
60dB	365	100(H)x390(W)x290(D)	4	FRONT LOAD, TEAR OFF, PRINTS CARDS	\$799	ANITECH	02 648 1711
-	365	203(H)x558(W)x457(D)	21	400 CPS AND IBM COAX/TWINAX AVAILABLE	NA	GENICOM (AUSTRALIA) PTY LTD	02 406 6411
57dB	180	118(H)x593(W)x358(D)	7	-	\$1550	DATRONICS CORP	02 887 9333
59dB	180	90(H)x373(W)x240(D)	5	BOTTOM FEED, COM-MODORE INTERFACE	\$586	DATRONICS CORPORATION LTD	02 887 9333
58dB	180	90(H)x403(W)x344(D)	5	-	\$908	DATRONICS CORPORATION LTD	02 887 9333
58dB	180	90(H)x575(W)x-	354	-	\$1138	DATRONICS CORP LTD	02 887 9333
58dB	180	90(H)x403(W)x344(D)	5	-	\$1092	DATRONICS CORP	02 887 9333
-	180	90(H)x575(W)x354(D)	7	-	\$1552	DATRONICS CORP LTD	02 887 9333
55dB	90	128(H)x524(W)x278(D)	6	-	\$899	COMMODORE BUSINESS MACHINES	02 427 4888
-	90	97(H)x367(W)x305(D)	6	46 TYPE FACES CAN BE UTILISED	\$1299	COMMODORE BUSINESS MACHINES	02 427 4888
-	365	104(H)x401(W)x337(D)	8	FRONT PANEL SELECTION OF PRINT MODES	\$560	DACOS PTY. LTD.	03 729 0044
-	90	125(H)x384(W)x315(D)	5	-	\$499	DICK SMITH ELECTRONICS	02 888 3200
55dB	365	248(H)x584(W)x338(D)	18	P-SERIES/IBM GRAPHICS/IBM COLOUR OPTION	\$3612	DATAPRODUCTS	02 451 3533
55dB	365	127(H)x439(W)x330(D)	10	PAPER PARK/IBM PROPRINTER	\$1212	DATAPRODUCTS CORP	02 452 3533
55dB	365	127(H)x436(W)x330(D)	10	DIABLO 630, PAPER PARK	\$1770	DATAPRODUCTS CORP	02 451 3533
55dB	365	127(H)x584(W)x330(D)	12	PAPER PARK/IBM PROPRINTER/COLOUR OPTION	\$1548	DATAPRODUCTS CORP	02 451 3533
55dB	365	127(H)x584(W)x330(D)	12	DIABLO 630/COLOUR OPTION	\$2103	DATAPRODUCTS CORP	02 451 3533

Dot matrix printers

Make	Model	Serial interface	Parallel interface	Draft speed (cps)	NLQ mode	NLQ speed (cps)	Max paper width (in)	Minimum pitch (cpi)	Maximum pitch (cpi)	Max chars per line	Bi-directnl prnt head	Bi-directnl paper feed	Num. print pins/wires	Max graphics (dpi)	Buffer size	Tractor feed	Friction feed	Sheet feed	Proportnl print mode	D/loadable char set	IBM graphics compat	Epson model compat
DATA-PRODUCTS	8012	N	Y	180	Y	30	10	17	5	132	Y	N	9	240	2	Y	Y	N	N	Y	Y	FX-80
DATA-PRODUCTS	8022	N	Y	180	Y	30	15	17	5	230	Y	N	9	240	2	Y	Y	N	N	Y	Y	FX-100
DATASOUTH	DS-180 PLUS	Y	Y	180	N	-	15	5	16	217	Y	Y	9	72	4	Y	N	N	N	Y	N	NO
DATASOUTH	DS-220	Y	Y	220	Y	40	15	5	16	217	Y	Y	9	144	8	Y	Y	Y	N	Y	Y	MX80/100
DATASOUTH	DS-400	Y	Y	400	Y	108	15	5	16	217	Y	Y	18	144	16	Y	Y	Y	N	Y	Y	MX80/100
EPSON	EX-1000	Y	Y	300	Y	50	16	5	20	272	Y	Y	9	240	8	Y	Y	Y	Y	Y	Y	EX /FX /LX
EPSON	EX-800	Y	Y	300	Y	50	10	5	20	160	Y	Y	9	240	8	Y	Y	Y	Y	Y	Y	EX /FX /LX
EPSON	FX-1000	N	Y	240	Y	48	16	5	20	272	Y	N	9	240	8	Y	Y	Y	Y	Y	Y	FX /EX /LX
EPSON	FX-800	N	Y	240	Y	48	10	5	20	160	Y	N	9	240	8	Y	Y	Y	Y	Y	Y	FX /EX /LX
EPSON	LQ-1000	Y	Y	216	Y	72	16	5	20	272	Y	N	24	360	7	N	Y	Y	Y	Y	Y	LQ / SQ
EPSON	LQ-2500+	Y	Y	324	Y	108	16	5	20	272	Y	N	24	360	8	Y	Y	Y	Y	Y	Y	LQ /SQ
EPSON	LQ-800	Y	Y	216	Y	72	10	5	20	160	Y	N	24	360	7	N	Y	Y	Y	Y	Y	LQ /SQ
EPSON	LX-800	N	Y	180	Y	30	10	5	20	160	Y	N	9	240	3	Y	Y	Y	N	Y	Y	FX /EX
FACIT	B3100	Y	Y	250	Y	60	-	5	17	136	Y	Y	9	240	12	Y	Y	Y	Y	Y	Y	FX/JX
FACIT	B3150	Y	Y	250	Y	60	16	5	17	224	Y	Y	9	240	12	Y	Y	Y	Y	Y	Y	FX/JX
FACIT	B3350C	Y	Y	200	Y	100	16	5	17	224	Y	Y	18	240	12	Y	Y	Y	Y	Y	Y	FX/JX
FACIT	C5500	Y	Y	250	Y	60	16	5	20	272	Y	Y	9	240	2	Y	Y	Y	Y	Y	Y	FX/JX

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
-	90	125(H)x425(W)x345(D)	-	-	\$895	DATAPRODUCTS CORP	02 451 3533
-	90	125(H)x554(W)x345(D)	-	-	\$995	DATAPRODUCTS CORP	02 451 3533
59dB	90	175(H)x600(W)x400(D)	16	BUILT IN TRACTOR FEED, 6 PART PAPER CAPBL	\$1908	KENELEC PTY LTD	03 560 1011
59dB	90	175(H)x600(W)x400(D)	16	-	\$2327	KENELEC PTY LTD	03 560 1011
59dB	90	175(H)x600(W)x400(D)	16	-	\$2895	KENELEC PTY LTD	03 560 1011
66dB	365	121(H)x591(W)x388(D)	11	COLOUR OPTION, SHEET FEEDERS, ID & FONTS	\$1450	EPSON AUSTRALIA PTY LIMITED	02 452 5222
66dB	365	119(H)x420(W)x378(D)	10	COLOUR OPTION, SHEET FEEDERS, ID & FONTS	\$1120	EPSON AUSTRALIA PTY LIMITED	02 452 5222
65dB	365	90(H)x528(W)x340(D)	9	DBLE HEIGHT, AUTO LOAD, OPT; SB/CSF, SER. I/F	\$1190	EPSON AUSTRALIA PTY LIMITED	02 452 5222
65dB	365	90(H)x405(W)x334(D)	7	AUTO LOAD, 2 NLQ FONTS, OPT; SB/CSF, SER. I/F	\$950	EPSON AUSTRALIA PTY LIMITED	02 452 5222
66dB	365	93(H)x596(W)x335(D)	8	OPT; FONT MODULES, TRACTOR, SINGLE BIN CSF	\$1510	EPSON AUSTRALIA PTY LIMITED	02 452 5222
57dB	365	170(H)x591(W)x375(D)	12	AUTO LOAD, TEAR BAR, OPT; COLOUR, S&DBL CSF	\$2250	EPSON AUSTRALIA PTY LIMITED	02 452 5222
66dB	365	93(H)x420(W)x335(D)	6	OPT; TRACTOR, FONT MODULES, IBM, DIABLO EMUL	\$1100	EPSON AUSTRALIA PTY LIMITED	02 452 5222
63dB	365	91(H)x377(W)x308(D)	5	2 NLQ FONTS, OPT; SINGLE CSF, SERIAL I/F	\$650	EPSON AUSTRALIA PTY LIMITED	02 452 5222
55dB	365	144(H)x494(W)x400(D)	11	COLOUR, MENU SET-UP	\$1650	ELMEASCO INSTRUMENTS	02 427 3322
55dB	365	144(H)x622(W)x400(D)	15	COLOUR, MENU-SETUP, PAPER PARKING	\$2350	ELMEASCO INSTRUMENTS	02 427 3322
55dB	365	144(H)x622(W)x400(D)	15	COLOUR, PAPER PARKING, ZERO TEAR-OFF	\$2676	ELMEASCO INSTRUMENTS	02 427 3322
55dB	90	196(H)x584(W)x458(D)	14	ZERO TEAR-OFF, BOTTOM FEED, PARKING	\$3864	ELMEASCO INSTRUMENTS	02 427 3322

Dot matrix printers

Make	Model	Serial interface	Parallel interface	Draft speed (cps)	NLQ mode	NLQ speed (cps)	Max paper width (in)	Minimum pitch (cpi)	Maximum pitch (cpi)	Max chars per line	Bi-directnl prnt head	Bi-directnl paper feed	Num. print pins/wires	Max graphics (dpi)	Buffer size	Tractor feed	Friction feed	Sheet feed	Proportnl print mode	D/loadable char set	IBM graphics compat	Epson model compat
FACIT	C7500	Y	Y	400	Y	100	16	5	17	231	Y	Y	18	240	4	Y	Y	Y	Y	Y	Y	FX/JX
FUJITSU	DL2400	Y	Y	261	Y	72	16.5	10	20	271	Y	Y	24	360	24	Y	Y	Y	Y	Y	Y	FX-100
FUJITSU	DL2400-COLOUR	Y	Y	216	Y	72	16.5	10	20	271	Y	Y	24	360	24	Y	Y	Y	Y	Y	Y	FX-100
FUJITSU	DL2600	Y	Y	288	Y	96	16.5	10	20	271	Y	Y	24	360	24	Y	Y	Y	Y	Y	Y	FX-100
FUJITSU	DL2600-COLOUR	Y	Y	288	Y	96	16.5	10	20	271	Y	Y	24	360	24	Y	Y	Y	Y	Y	Y	FX-100
FUJITSU	DL3300	N	Y	288	Y	72	10	10	20	160	Y	Y	24	360	24	Y	Y	Y	Y	Y	Y	FX80
FUJITSU	DL3400	N	Y	288	Y	72	16.5	10	20	272	Y	Y	24	360	24	Y	Y	Y	Y	Y	Y	FX80
FUJITSU	DL5600	Y	Y	486	Y	162	16.5	10	20	272	Y	Y	24	360	24	Y	Y	Y	Y	Y	Y	FX80
FUJITSU	DX2100	N	Y	220	Y	44	10.5	10	15	137	Y	Y	9	240	8	Y	Y	Y	Y	Y	Y	FX80
FUJITSU	DX2200	N	Y	220	Y	45	16.5	10	17	233	Y	Y	9	240	8	Y	Y	Y	Y	Y	Y	FX80
FUJITSU	DX2300	N	Y	324	Y	54	10.5	10	20	160	Y	Y	9	240	18	Y	Y	Y	Y	Y	Y	FX80
FUJITSU	DX2400	N	Y	324	Y	54	16.6	10	20	272	Y	Y	9	240	16	Y	Y	Y	Y	Y	Y	FX80
GENICOM	1020	Y	Y	200	Y	100	16	10	12	-	Y	Y	18	240	-	Y	Y	Y	-	-	Y	FX-100/FJ
GENICOM	3184T, 3304T, 3404T	Y	Y	400	Y	-	15.5	10	18	-	Y	Y	9	-	-	Y	Y	Y	Y	Y	Y	-
GENICOM	3210	Y	Y	240	Y	60	15.5	10	18	240	Y	Y	9	-	2	-	Y	Y	Y	Y	Y	-
GENICOM	3310	Y	Y	300	Y	75	15.5	10	18	360	Y	Y	9	-	-	Y	Y	Y	Y	Y	Y	-
GENICOM	3320	Y	Y	300	Y	150	15.5	10	18	360	Y	Y	18	-	-	Y	Y	Y	Y	Y	Y	-

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
57dB	90	196(H)x584(W)x458(D)	18	ZERO TEAR-OFF, MENU SET-UP	\$5250	ELMEASCO INSTRUMENTS	02 427 3322
53dB	365	195(H)x570(W)x390(D)	20	EMULATION SELECT,AUTO SHEET LOAD	\$1850 EXTAX	FUJITSU AUSTRALIA LTD	02-959 6544
53dB	365	195(H)x570(W)x390(D)	20		\$2166	FUJITSU AUSTRALIA LTD	02-959 6544
55dB	365	195(H)x570(W)x390(D)	20	EMULATION SELECT,LCD DISPLAY	\$2450 EXTAX	FUJITSU AUSTRALIA LTD	02-959 6544
55dB	365	195(H)x570(W)x390(D)	20	EMULATION SELECT,AUTO SHEET LOAD	\$2730 EXTAX	FUJITSU AUSTRALIA LTD	02-959 6544
55dB	365	128(H)x238(W)x345(D)	10	FONT CARDS,EMULATION SELECT,SERIAL OPTN	\$1450 EXTAX	FUJITSU AUSTRALIA LTD	02-959 6544
55dB	365	120(H)x580(W)x345(D)	12	COLOUR OPTION,FONT CARDS,SERIAL OPTN	\$1650 EXTAX	FUJITSU AUSTRALIA LTD	02-959 6544
55dB	365	186(H)x600(W)x385(D)	20	FONT CARDS,EMULATION SELECT,LCD DISPLAY	\$3700 EXTAX	FUJITSU AUSTRALIA LTD	02-959 6544
55dB	365	120(H)x438(W)x354(D)	9	COLOUR OPTION,SERIAL INTERFACE	\$922 EXTAX	FUJITSU AUSTRALIA LTD	02-959 6544
55dB	365	120(H)x580(W)x345(D)	12	COLOUR OPTION,SERIAL INTERFACE OPTION	\$1195 EXTAX	FUJITSU AUSTRALIA LTD	02-959 6544
55dB	365	120(H)x438(W)x354(D)	9	COLOUR OPTION,SWITCH-ABLE EMULATION	\$1050 EXTAX	FUJITSU AUSTRALIA LTD	02-959 6544
55dB	365	120(H)x580(W)x345(D)	12	COLOUR OPTION,SWITCH-ABLE EMULATION	\$1350 EXTAX	FUJITSU AUSTRALIA LTD	02-959 6544
-	365	254(H)x619(W)x417(D)	39	COLOUR, 80 COL. VERSION, DIABLO 630	\$2138	IMPACT DATASCAPE, C & PA	02 451 3533
-	365	161(H)x636(W)x409(D)	15	TEMPEST MODELS ONLY	NA	GENICOM (AUSTRALIA) PTY LTD	02 406 6411
-	365	161(H)x636(W)x409(D)	16	OKIDATA 84	\$3211	IMPACT, C & PA	02 451 3533
-	365	161(H)x636(W)x409(D)	15	COLOUR VERSION, DIABLO 630	\$4693	IMPACT DATASCAPE, C & PA	02 451 3533
-	365	183(H)x663(W)x488(D)	16	QUIETISED MODELS, DI-ABLE 630	\$5229	IMPACT DATASCAPE, C & PA	02 451 3533

Dot matrix printers

Make	Model	Serial interface	Parallel interface	Draft speed (cps)	NLQ mode	NLQ speed (cps)	Max paper width (in)	Minimum pitch (cpi)	Maximum pitch (cpi)	Max chars per line	Bi-directnl prnt head	Bi-directnl paper feed	Num. print pins/wires	Max graphics (dpi)	Buffer size	Tractor feed	Friction feed	Sheet feed	Proportnl print mode	D/loadable char set	IBM graphics compat	Epson model compat
GENICOM	3410	Y	Y	400	Y	100	15.5	10	18	540	Y	Y	18	-	-	Y	Y	Y	Y	Y	Y	-
MANNESMANN TALLY	MT145-S	Y	Y	120	N	-	3-15	10	20	264	Y	Y	9	240	2	Y	Y	N	N	Y	Y	FX
MANNESMANN TALLY	MT290	Y	Y	200	Y	50	3-16	10	20	264	Y	Y	9	240	3	Y	Y	Y	Y	Y	Y	FX
MANNESMANN TALLY	MT330	Y	Y	300	Y	150	3-16	10	17	232	Y	Y	24	240	3	Y	Y	Y	N	Y	Y	FX
MANNESMANN TALLY	MT490	Y	Y	400	Y	150	3-16	10	17	225	Y	Y	18	240	8	Y	Y	Y	Y	Y	Y	FX
MANNESMANN TALLY	MT85	Y	Y	180	Y	45	4-10	10	17	137	Y	Y	9	240	3	Y	Y	N	Y	Y	Y	FX
MANNESMANN TALLY	MT86	Y	Y	180	Y	45	4-10	10	17	218	Y	Y	9	240	3	Y	Y	N	Y	Y	Y	FX
MANNESMANN TALLY	MT87	Y	Y	200	Y	50	4-10	10	17	137	Y	Y	9	240	3	Y	Y	Y	Y	Y	Y	FX
MANNESMANN TALLY	MT88	Y	Y	200	Y	50	4-16	10	17	218	Y	Y	9	240	3	Y	Y	Y	Y	Y	Y	FX
OKI MICROLINE	ML 183	Y	Y	120	Y	20	15	10	17	132	Y	N	9	240	2	Y	Y	Y	Y	N	Y	-
OKI MICROLINE	ML 192 PLUS	Y	Y	200	Y	40	10	10	17	80	Y	N	9	288	8	Y	Y	Y	Y	N	Y	-
OKI MICROLINE	ML 292	Y	Y	200	Y	100	10	10	17	80	Y	N	18	288	8	Y	Y	Y	Y	N	Y	-
OKI MICROLINE	ML 182	Y	Y	120	Y	20	10	10	17	80	Y	N	9	240	2	Y	Y	Y	Y	N	Y	-
OKI MICROLINE	ML 193 PLUS	Y	Y	200	Y	40	15	10	17	132	Y	N	9	288	8	Y	Y	Y	Y	N	Y	-
OKI MICROLINE	ML 293	Y	Y	200	Y	100	15	10	17	132	Y	N	18	288	8	Y	Y	Y	Y	N	Y	-
OKI MICROLINE	ML 294	Y	Y	400	Y	100	15	10	17	132	Y	N	18	288	8	Y	Y	Y	Y	N	Y	-
OLIVETTI	DM105/1	N	Y	115	Y	25	10	10	14	137	Y	N	9	240	6	N	Y	Y	N	Y	Y	JX80

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
	365	183(H)x668(W)x488(D)	15	QUIETISED, BARCODES, IBM COAX/TWINAX	\$5898	IMPACT DATASCAPE, C & PA	02 451 3533
57dB	90	28(H)x47(W)x26(D)	10	SPECIAL HEAVY DUTY FORMS PRINTER-9 PART	\$2290	MICROPROCESSOR APPLICATIONS	03 894 1500
60dB	90	15(H)x48(W)x24(D)	9	HEAVY DUTY,CART.FOR FONTS,B-CODE & I/FAC	\$2245	MICROPROCESSOR APPLICATIONS	03 894 1500
53dB	90	17(H)x61(W)x43(D)	23	HEAVY DUTY,PUSH/PULL TRACTORS,QUICK TEAR	\$3954	MICROPROCESSOR APPLICATIONS	03 894 1500
60dB	90	23(H)x66(W)x46(D)	33	HEAVY DUTY,15 IPS,PUSH/PULL TRACTORS	\$6884	MICROPROCESSOR APPLICATIONS	03 894 1500
55dB	90	170(H)x430(W)x300(D)	7	PLUG IN I/F MODULES & TYPE STYLE CART.	\$1127	MICROPROCESSOR APPLICATIONS	03 894 1500
55dB	90	17(H)x590(W)x28(D)	10	PLUG IN I/F MODULES & TYPE STYLE CART.	\$1550	MICROPROCESSOR APPLICATIONS	03 894 1500
55dB	90	20(H)x470(W)x35(D)	11	PUSH TRACTORS,TEAR BAR,5000 HOURS MTBF	\$1339	MICROPROCESSOR APPLICATIONS	03 894 1500
55dB	90	20(H)x62(W)x35(D)	13	PUSH TRACTORS,TEAR BAR,5000 HOURS MTBF	\$1770	MICROPROCESSOR APPLICATIONS	03 894 1500
55dB	90	128(H)x524(W)x278(D)	6	OPTIONAL 8K BUFFER	\$1131	IPL DATRON PTY LTD	02 698 8211
57dB	90	80(H)x372(W)x275(D)	4	RS232C CLOOP BOARD AVAILABLE	\$1123	IPL DATRON PTY LTD	02 698 8211
57dB	90	97(H)x367(W)x305(D)	6	COLOUR PRINTER,32K BUFFER OPTIONAL	\$1741	IPL DATRON PTY LTD	02 698 8211
55dB	90	80(H)x372(W)x278(D)	4	OPTIONAL 8K BUFFER	\$725	IPL DATRON PTY LTD	02 698 8211
57dB	90	128(H)x524(W)x278(D)	6	RS232C CLOOP BOARD AVAILABLE	\$1475	IPL DATRON PTY LTD	02 698 8211
57dB	90	97(H)x521(W)x305(D)	8	COLOUR PRINTER, 23K BUFFER OPTIONAL]	\$2123	IPL DATRON PTY LTD	02 698 8211
57dB	90	97(H)x521(W)x305(D)	8	COLOUR PRINTER, 32K BUFFER OPTIONAL	\$3248	IPL DATRON PTY LTD	02 698 8211
60dB	90	94(H)x270(W)x253(D)	5	4 COLOUR. TRACTOR FEED OPTIONAL	\$689	COMPUTERMATE PRODUCTS AUST Pty Ltd	02 457 8118

Dot matrix printers

Make	Model	Serial interface	Parallel interface	Draft speed (cps)	NLQ mode	NLQ speed (cps)	Max paper width (in)	Minimum pitch (cpi)	Maximum pitch (cpi)	Max chars per line	Bi-directnl prnt head	Bi-directnl paper feed	Num. print pins/wires	Max graphics (dpi)	Buffer size	Tractor feed	Friction feed	Sheet feed	Proportnl print mode	D/loadable char set	IBM graphics compat	Epson model compat
OMNI 800	810	Y	N	150	N	-	15	16	5	132	Y	N	9	-	-	Y	N	N	N	N	N	-
OMNI 800	820 KSR	Y	N	150	N	-	15	16	5	132	Y	N	9	-	1	Y	N	N	N	N	N	-
OMNI 800	850XL	Y	Y	150	Y	90	11	16	5	134	Y	N	9	144	-	Y	Y	Y	N	Y	N	-
OMNI 800	855	Y	Y	150	Y	35	11	16	5	134	Y	Y	9	144	-	Y	Y	Y	Y	Y	Y	-
OMNI 800	860XL	Y	Y	150	N	90	15	16	5	134	Y	N	9	144	-	Y	Y	N	N	N	N	-
OMNI 800	865	Y	Y	150	Y	35	15	16	5	132	Y	Y	9	144	-	Y	Y	N	Y	Y	Y	-
OMNI 800	880 AT	Y	Y	300	Y	150	15	16	5	132	Y	N	9	120	2	Y	N	N	N	N	Y	-
OMNI 800	880 DP	Y	Y	300	Y	150	15	16	5	132	Y	N	9	120	2	Y	N	N	N	N	N	-
OMNI 800	885	Y	Y	300	Y	75	10	16	5	132	Y	N	9	144	6	Y	N	N	N	N	N	-
PANASONIC	KXP-1081	N	Y	120	Y	24	10	5	17	137	Y	N	9	240	1	Y	Y	N	N	Y	Y	-
PANASONIC	KXP-1082	N	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PANASONIC	KXP-1083	N	Y	240	Y	48	10	5	17	137	Y	Y	9	240	38	Y	Y	N	Y	Y	Y	FX-80
PANASONIC	KXP-1592	N	Y	180	Y	38	16.5	5	17	233	Y	Y	9	240	7	Y	Y	N	Y	Y	Y	FX-100
PANASONIC	KXP-1595	N	Y	240	Y	51	16.5	5	17	233	Y	Y	9	240	15	Y	Y	N	Y	Y	Y	FX-100
RITEMAN	SUPER C+	Y	N	120	Y	30	10	5	17	160	Y	N	9	960	0	Y	Y	Y	Y	Y	N	GX80
SAKATA	SP-1200PLUS	Y	Y	120	Y	30	10	-	-	136	Y	Y	9	192	-	Y	Y	Y	Y	N	Y	FX-80
SAKATA	SP-5500	Y	Y	180	Y	36	16	-	-	233	Y	Y	9	204	3	Y	Y	Y	Y	Y	Y	FX-100

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
-	90	203(H)x635(W)x508(D)	25	9 PART PAPER HANDLING, FAST SLEW RATE	\$2875	TEXAS INSTRUMENTS AUSTRALIA LTD	02 887 1122
-	90	203(H)x635(W)x508(D)	-	128 CHAR KEYBOARD 5 PART PAPER HANDLING	\$3438	TEXAS INSTRUMENTS AUSTRALIA LTD	02 887 1122
62dB	90	127(H)x411(W)x330(D)	7	OPT 4K BUFFER, XON XOFF	\$1265	TEXAS INSTRUMENTS AUSTRALIA LTD	02 778 1122
62dB	90	127(H)x420(W)x330(D)	7	OPT FONT CARTRIDGES, BAR CODE ETC	\$1495	TEXAS INSTRUMENTS AUSTRALIA LTD	02 887 1122
62dB	90	127(H)x571(W)x335(D)	9	OPT 4K BUFFER, XON XOFF	\$1830	TEXAS INSTRUMENTS AUSTRALIA LTD	02 887 1122
62dB	90	127(H)x571(W)x335(D)	9	OPT FONT CARTIDGE, BUFFERS ETC	\$2060	TEXAS INSTRUMENTS AUSTRALIA LTD	02 887 1122
-	90	203(H)x635(W)x508(D)	25	OPT 4K, 16K BUFFER SNA/SDLC COAX	\$4140	TEXAS INSTRUMENTS AUSTRALIA LTD	02 887 1122
-	90	203(H)x635(W)x508(D)	25	OPT 4K, 16K BUFFERS, SNA/SDLC COAX	\$4140	TEXAS INSTRUMENTS AUSTRALIA LTD	02 887 1122
65dB	90	229(H)x450(W)x450(D)	23	ZERO TEAR OFF LENGTH, OPT 16K BUFFER	\$4890	TEXAS INSTRUMENTS AUSTRALIA LTD	02 887 1122
66dB	360	115(H)x403(W)x286(D)	6	IBM GRAPHICS PRINTER COMPATIBLE	\$495	MULTITECH COMPUTERS PTY LTD	03 338 3911
66dB	360	115(H)x403(W)x286(D)	7	-	\$545	MULTITECH COMPUTERS PTY LTD	03 338 3911
66dB	360	137(H)x427(W)x350(D)	10	IBM PROPRINTER COM- PATIBLE, 1" TEAR BAR	\$695	MULTITECH COMPUTERS PTY LTD	03 338 3911
64dB	360	155(H)x610(W)x390(D)	14	IBM GRAPHICS PRINTER COMPATIBLE	\$995	MULTITECH COMPUTERS PTY LTD	03 338 3911
66dB	360	155(H)x610(W)x390(D)	15	DIABLO 630 EMULATION.	\$1150	MULTITECH COMPUTERS PTY LTD	03 338 3911
60dB	365	120(H)x400(W)x330(D)	6	COMMODORE 64/128 COM- PATIBLE	\$549	COMPUTERMATE PRODUCTS AUST PTY LTD	02 457 8118
55dB	365	104(H)x401(W)x337(D)	7	SCIENTIFIC CHARACTER SET	\$399	EMONA COMPUTERS PTY LTD	02 519 3933
55dB	365	103(H)x561(W)x341(D)	10	-	\$680	EMONA COMPUTERS PTY LTD	02 519 3933

Dot matrix printers

Make	Model	Serial interface	Parallel interface	Draft speed (cps)	NLQ mode	NLQ speed (cps)	Max paper width (in)	Minimum pitch (dpi)	Maximum pitch (dpi)	Max chars per line	Bi-directnl prnt head	Bi-directnl paper feed	Num. print pins/wires	Max graphics (dpi)	Buffer size	Tractor feed	Friction feed	Sheet feed	Proportnl print mode	D/loadable char set	IBM graphics compat	Epson model compat
SAKATA	SP-7000	Y	Y	220	Y	85	16	-	-	233	Y	Y	24	357	32	Y	Y	Y	Y	Y	Y	LQ2500
STAR MICRONICS	NB-15	N	Y	300	Y	100	15	3	16	222	Y	Y	24	240	16	Y	Y	Y	Y	Y	Y	LQ-1500
STAR MICRONICS	NB-2410	N	Y	216	Y	72	10	3	17	137	Y	Y	24	360	8	Y	Y	Y	Y	Y	Y	LQ-800
STAR MICRONICS	NB-2415	N	Y	216	Y	72	15	3	17	233	Y	Y	24	360	5	Y	Y	Y	Y	Y	Y	LQ-1000
STAR MICRONICS	ND-10	N	Y	180	Y	45	10	3	20	160	Y	Y	9	240	12	Y	Y	Y	Y	Y	Y	FX-85
STAR MICRONICS	ND-15	N	Y	180	Y	45	15	3	20	272	Y	Y	9	240	12	Y	Y	Y	Y	Y	Y	EX-1000
STAR MICRONICS	NL-10	Y	Y	120	Y	30	10	3	20	160	Y	Y	9	240	5	Y	Y	Y	Y	Y	Y	LX-800
STAR MICRONICS	NR-15	N	Y	240	Y	60	15	3	20	272	Y	Y	9	240	12	Y	Y	Y	Y	Y	Y	EX-1000
STAR MICRONICS	NX-10	N	Y	120	Y	30	10	3	20	160	Y	Y	9	240	5	Y	Y	Y	Y	Y	Y	LX-800
STAR MICRONICS	NX-15	N	Y	120	Y	30	15	3	20	272	Y	Y	9	240	4	Y	Y	Y	Y	Y	Y	FX-105
STAR	NX10C	Y	N	120	Y	30	10	5	17	160	Y	Y	9	960	0	Y	Y	Y	Y	Y	N	GX80
SUPER5	EP-1201A	N	Y	120	Y	24	10	5	17	137	Y	N	9	240	1	Y	Y	N	N	Y	Y	-
SUPER5	EP-1600	N	Y	160	Y	32	10	5	17	137	Y	N	9	240	1	Y	Y	N	Y	Y	Y	-
TANDY	DMP 106	Y	Y	80	-	-	11*9	10	16	80	Y	Y	-	-	1	Y	Y	N	-	Y	Y	-
TANDY	DMP 130A	Y	Y	100	-	-	11*9	10	17	80	Y	Y	-	-	1	Y	Y	N	-	Y	Y	-
TANDY	DMP 2200	N	Y	380	-	-	11*15	10	17	132	Y	Y	-	240	4	Y	Y	N	Y	Y	Y	-
TANDY	DMP 430	Y	Y	180	-	-	11*15	10	16	132	Y	Y	18	-	2	Y	Y	N	-	Y	Y	-

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
53dB	365	117(H)x575(W)x370(D)	11	MODULES: IBM PROPRINTER; FONTS; COLOUR		EMONA COMPUTERS PTY LTD	02 519 3933
61dB	365	121(H)x580(W)x383(D)	15	WELL BUILT-RELIABLE DMP-PUSH TRACTOR	\$1799 +Tax	STAR MICRONICS AUSTRALIA	02 736 1144
61dB	365	121(H)x400(W)x383(D)	10	BEST 10 INCH NLQ + GRAPHIC DMP AVAILABLE	\$1115 +Tax	STAR MICRONICS AUSTRALIA	02 736 1144
61dB	365	121(H)x580(W)x383(D)	15	BEST 15INCH NLQ + GRAPHICS DMP AVAILABLE	\$1490 +Tax	STAR MICRONICS AUSTRALIA	02 736 1144
62dB	365	103(H)x400(W)x360(D)	8	PUSH TRACTOR-TEAR BAR-INEXPENSIVE EXTRAS	\$895 +Tax	STAR MICRONICS AUSTRALIA	02 736 1144
61dB	365	105(H)x542(W)x360(D)	11	OPTIONAL RS232 & 16K BUFFER-PUSH TRACTOR	\$999 +Tax	STAR MICRONICS AUSTRALIA	02 736 1144
59dB	365	104(H)x400(W)x336(D)	7	FIVE OPTIONAL INTER-FACES-PUSH TRACTOR	\$499 +Tax	STAR MICRONICS AUSTRALIA	02 736 1144
60dB	365	105(H)x542(W)x360(D)	12	BETTER LQ THAN EPSON LQ2500-PUSH TRACTOR	\$1249 +Tax	STAR MICRONICS AUSTRALIA	02 736 1144
57dB	365	104(H)x400(W)x336(D)	7	PUSH TRACTOR-TEAR BAR-LONG RIBBON LIFE	\$525 +Tax	STAR MICRONICS AUSTRALIA	02 736 1144
58dB	365	105(H)x542(W)x360(D)	11	PUSH TRACTOR-TEAR BAR-OPTIONAL RS232	\$749 +Tax	STAR MICRONICS AUSTRALIA	02 736 1144
60dB	365	104(H)x400(W)x336(D)	7	COMMODORE 64/128 COMPATIBLE ONLY	\$599	COMPUTERMATE PRODUCTS AUST PTY LTD	02 457 8118
66dB	90	115(H)x403(W)x286(D)	6	IBM GRAPHICS PRINTER COMPATIBLE	\$495	MULTITECH COMPUTERS PTY LTD	03 338 3911
66dB	90	115(H)x403(W)x286(D)	7	IBM GRAPHICS PRINTER COMPATIBLE	\$545	MULTITECH COMPUTERS PTY LTD	03 338 3911
-	90	8(H)x39(W)x24(D)	3	480 - 800 DOTS PER LINE	\$399	INTERTAN AUSTRALIA LTD	02 675 1222
-	90	12(H)x39(W)x27(D)	4	480 TO 1920 DOT COLUMNS / LINE	\$599	INTERTAN AUSTRALIA LTD	02 675 1222
-	90	12(H)x57(W)x42(D)	18	PRINTS ORIGINAL PLUS UP TO 6 COPIES	\$2599	INTERTAN AUSTRALIA LTD	02 675 1222
-	90	8(H)x39(W)x24(D)	4	HORIZONTAL DOT RESOLUTION:800 DOTS/LINE	\$1299	INTERTAN AUSTRALIA LTD	02 675 1222

Dot matrix printers

Make	Model	Serial interface	Parallel interface	Draft speed (cps)	NLQ mode	NLQ speed (cps)	Max paper width (in)	Minimum pitch (cpi)	Maximum pitch (cpi)	Max chars per line	Bi-directnl prnt head	Bi-directnl paper feed	Num. print pins/wires	Max graphics (dpi)	Buffer size	Tractor feed	Friction feed	Sheet feed	Proportnl print mode	D/loadable char set	IBM graphics compat	Epson model compat
TECO	VP1814	Y	Y	180	Y	36	10	-	-	132	Y	Y	9	-	7	Y	Y	N	Y	Y	Y	FX-80
TOSHIBA	P321SL	Y	Y	216	Y	72	10	10	16	132	Y	Y	24	360	32	Y	Y	Y	Y	Y	Y	LQ1500
TOSHIBA	P341E	Y	Y	216	Y	72	15	10	16	226	Y	N	24	360	2	Y	Y	Y	Y	Y	Y	NO
TOSHIBA	P351	Y	Y	300	Y	100	15	10	16	226	Y	Y	24	360	4	Y	Y	Y	Y	Y	Y	NO
TOSHIBA	P351C	Y	Y	288	Y	100	15	10	16	226	Y	Y	24	360	4	Y	Y	Y	Y	Y	Y	NO
WENGER	1/1	Y	Y	160	Y	30	10	5	17	137	Y	Y	9	240	10	Y	Y	Y	Y	Y	Y	FX-80
WENGER	3/1	Y	Y	480	Y	150	17.48	5	1	233	Y	Y	18	72	12	Y	Y	Y	N	Y	Y	JX 80
WENGER	4/1	Y	Y	600	Y	130	15.7	10	15	236	Y	Y	18	240	40	Y	Y	Y	Y	Y	N	-

Thermal printers

Make	Model	Serial interface	Parallel interface	Draft speed (cps)	NLQ mode	NLQ speed (cps)	Max paper width (in)	Plain paper	Min pitch (cpi)	Max pitch (cpi)	Max charact per line	Bi-direct print head	Bi-direct paper feed	Max graphics (dpi)	Buffer size	Tractor feed	Friction feed	Sheet feed	Number of colours	D/loadable char set	IBM graphics compat	Epson model compat
COMMODORE	MCS 820	N	Y	80	Y	40	10	Y	-	-	132	N	N	144	8	Y	Y	N	-	N	Y	IBM
EPSON	P-40	Y	Y	45	N	0	4.5	N	-	-	80	N	N	120	1	N	Y	N	M	N	N	MX
OKI MICROLINE	OKIMATE20	Y	Y	80	Y	40	9.5	Y	-	-	132	N	N	144	8	Y	Y	N	16	Y	Y	-

Dot matrix printers

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
-	365	104(H)x401(W)x337(D)	8	-	\$599	E.M.E (SALES) PTY LTD	03 699 3088
54dB	365	98(H)x417(W)x380(D)	8	TOSHIBA QUME SPRINT 11 EMULATION, QUIET	\$1218	TOSHIBA AUSTRALIA PTY LTD	02 887 6057
59dB	365	150(H)x560(W)x380(D)	15	TOSHIBA QUME SPRINT 11 EMULATION	\$1454	TOSHIBA AUSTRALIA PTY LTD	02 887 6057
56dB	365	150(H)x560(W)x360(D)	14	TOSHIBA QUME SPRINT 11 EMULATION, QUIET	\$2294	TOSHIBA AUSTRALIA PTY LTD	02 887 6057
56dB	365	150(H)x560(W)x380(D)	15	COLOUR, TOSHIBA QUME SPRINT 11 EMULATION	\$2634	TOSHIBA AUSTRALIA PTY LTD	02 887 6057
48dB	90	204(H)x400(W)x328(D)	10	AUTO PAPER FEED TO TEAR-OFF AND RETURN	\$2936	DATATEL PTY LTD	03 690 4000
55dB	90	---	25	COLOUR. 3 PAPER HANDLING METHODS AS STD.	\$5173	DATATEL PTY LTD	03 690 4000
48dB	90	220(H)x660(W)x520(D)	29	IBM 3274/76 OR IBM 34/36/38 INTERFACE	\$13139	DATATEL PTY LTD	03 690 4000

Thermal printers

Noise level	Warranty length	Dimensions (mm)	Weight (kg)	Other features	Retail price	Distributor	Phone
30dB	90	60(H)x330(W)x190(D)	3	MAXIMUM NUMBER OF COLOURS IS 100 SHADES	\$499	COMMODORE BUSINESS MACHINES	02 427 4888
Not supplied	365	46(H)x216(W)x128(D)	1	PORTABLE, BATTERY OPERATED, INCS CHARGER	\$330	EPSON AUSTRALIA PTY LIMITED	02 452 5222
35dB	90	60(H)x330(W)x190(D)	3	ROLL PAPER STAND	\$781	IPL DATRON PTY LTD	02 698 8211

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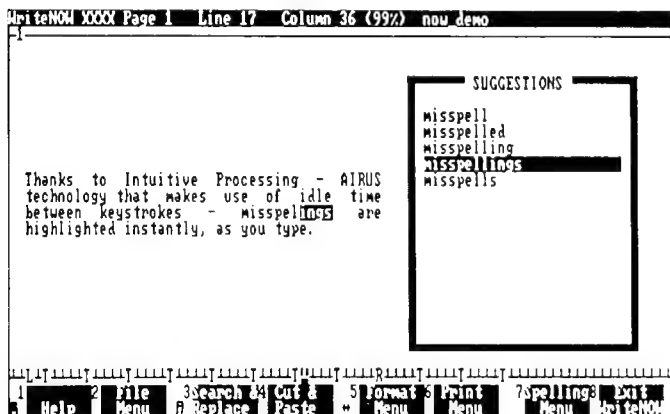
WRITE NOW has been extensively revised by OptSoft and includes an Australian Dictionary for spelling checking. The documentation has been written and printed **in Australia**.

Easy to use? Too right mate!

Take WRITE NOW out of the box. Place it in the diskette drive and type NOW <enter>. The programme and the Australian dictionary will load into memory. You start typing *immediately*. There's no installation procedure to hold you up. No copy protection to hassle you. No bag full of floppy discs. No wait.

Corrects Spelling As You Type

WRITE NOW highlights misspellings as you type - you don't need a separate spell-checking program. Mistakes are highlighted the instant they occur. Or, you can spell-check the entire document when you're through typing. The choice is yours.



Spelling suggestions are available. You can ask for them at any time, or have them pop up automatically the instant a misspelling occurs. Just scroll down to the correct word and it is automatically inserted the instant you press <enter>.

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If you wish, WRITE NOW will even complete words for you - a great feature if you are a *hunt and peck, find it and hit it typist*. For example, if you have just come back from a holiday in Norway and you are writing to tell a friend about your trip down a fjord, just type fj and, with Clairvoyance switched on, WRITE NOW will automatically add ord. That's *intuitive processing*!

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OptSoft have already included words like *haemorrhoidectomy* for people who know how to perform one but find spelling it a pain in the posterior region! However, if your profession has a vocabulary all of its own, OptSoft will create a dictionary for you from your word list after you have registered your copy of WRITE NOW — AT NO EXTRA CHARGE*.

*Free offer expires August 31, 1987. Small charge thereafter.

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- User defined page breaks
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- Advanced file management menus
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Mike Mudge deals with Polygonal, Pyramidal and Figurate Numbers.

Definition I: An 'Arithmetic Sequence' is a sequence of numbers each differing from the previous one by a constant.

Definition II: An 'Gnomon' is an 'Arithmetic Sequence' beginning with 1 and having a positive integer constant difference.

Thus G_1 : 1, 2, 3, 4, 5, 6, 7, 8, . . . constant difference = 1

G_2 : 1, 3, 5, 7, 9, 11, 13, . . . constant difference = 2

G_3 : 1, 4, 7, 10, 13, 16, . . . constant difference = 3

G_4 : 1, 5, 9, 13, 17, 21, . . . constant difference = 4

Definition III: To form the 'Polygonal Numbers' you add subsequent numbers from a Gnomon such as G_1 . So, for example, generating the polygonal sequence T_1 from G_1 will work as follows:

Take in figure

This sequence is called 'Triangular numbers'.

Similarly,

Take in figure

Note Hypsicles gave such a definition of Polygonal Numbers around 175BC. However, he did not have a simple graphics routine to display a given Polygonal Number as an array of dots of appropriate size and shape!

Definition IV: The 'Pyramidal Numbers' are those formed by taking the sum of increasing numbers of terms of a sequence of Polygonal Numbers in the same way as above.

Thus T : yields 1, 4, 10, 20, 35, 56, 84, 120, 165, . . . the Tetrahedral Numbers

S : yields 1, 5, 14, 30, 55, 91, 140, 204, 285, . . .

P : yields 1, 6, 18, 40, 75, 126, 196, 288, 405, . . .

H : yields 1, 7, 22, 50, 95, 161, 252, 372, 525, . . .

Note Hindu Aryabhata (476 AD) gave the formula $r(r+1)(r+2)/6$ for the r^{th} Tetrahedral Number. However, he did not have computer graphics available to display Pyramidal Numbers! Do you?

Definition V: The r^{th} 'Figurate Number' of order n is defined by $F_n^r = (r+n-1)(r+n-2) \dots (r)/(1.2.3 \dots n)$ which many readers will recognise as the 'Binomial Coefficient'

Take in figure

readily available, for restricted n & r , on most scientific pocket calculators.

Note F_2^r is the r^{th} Triangular Number. F_3^r is the r^{th} Tetrahedral Number; further, Fermat called F_4^r the r^{th} Triangulo-triangular Number.

Problems From the above general theory, a sample of specific problems follows:

(i): Which Triangular Numbers consist only of repetitions of a single digit? For example: 55.

(ii): Which square numbers are also tetrahedral? For example: 1 & 4.

(iii): Which Triangular Numbers are also pentagonal? For example: 1 & 210.

(iv): Which numbers are simultaneously triangular, pentagonal and hexagonal?

(v): Which pairs of Triangular Numbers have their sum and difference also triangular?

For example: 15 & 21.

(vi): More generally, which Polygonal Numbers of a given sequence are also Pyramidal Numbers of a given sequence? For example: 22 is a Polygonal Number of the third sequence and also a Pyramidal Number of the fourth sequence.

(vii): An abstract problem! How best to represent 'graphically' the r^{th} Figurate Number of order n ? Suggestion: firstly, implement, algorithms to represent 'graphically' the Polygonal Numbers and then the Pyramidal.

Readers are invited to send their thoughts, together with complete or partial attempts at the investigations of the above problems, to Mike Mudge, C/- APC, 124 Castlereagh Street, Sydney 2000, to arrive by 15 October, 1987. It

would be appreciated if such submissions contained a brief summary of results obtained in a form suitable for publication in APC. These submissions will be judged using subjective criteria, and a prize will be awarded by APC to the 'best' contribution received by the closing date.

Please note that submissions can only be returned if a stamped addressed envelope is provided.

Review: March 1987

Problem (i): Due to Professor Leo Alex; a number of submissions found 150 solutions. Refer to him for a proof of the finiteness of the solution set.

Problem (ii): Not too much progress here; although as an appetiser for further work:

The sum of two fourth powers in two different ways. That is:

$S = x^4 + y^4 + z^4 + w^4$ was completely solved by Euler algebraically.

Take in figure

Problem (III): attracted considerable attention; the greatest success in

(a) listing solutions up to $7094269 = 168^3 + 133^3 = 189^3 + 70^3$.

(b) The empirical evidence up to 10^8 says no! But how do we prove this?

The prizewinner, Richard Tindall, used a combination of Basic on a NewBrain and Basic (Microsoft) on the Kaypro 2000: 'Pascal is even less suitable'.

Mike Mudge welcomes correspondence on any subject within the areas of number theory and other computational mathematics. Particularly welcome are suggestions, either general or particular, for future Numbers Count articles; all letters will be answered in due course.

END

Brainteasers courtesy of JJ Clessa.

Quickie

If you write down every positive 2-digit number (that is, from 10 to 99), which digit will you have written the most number of times?

Prize puzzle

(1) Take a 4-digit palindromic number — that is, one which reads the same from right to left as it does from left to right.

(2) Reverse the digits and add the result to give a new number.

(3) Repeat step 2 with the new number until the result becomes palindromic.

To illustrate, suppose we have the

number 3883;

$$3883 + 3883 = 7766$$

$$7766 + 6677 = 14443$$

$$14443 + 34441 = 48884$$

which is palindromic after three cycles only.

Two numbers, however, do not yield palindromic results even after 1000 cycles. What are they?

Answers on postcards, please, or backs of envelopes only, to reach APC, Lazing Around September, 124 Castlereagh Street, Sydney 2000, no later than 30 September 1987.

June prize puzzle

A moderate response this month. As usual there was a trace of ambiguity in the problem — does the digit zero follow the digit 9 in the definition of 'consecutive'?

We decided not, since the problem already stated '... digits 0-9 are used ...', which really precludes the ambiguity. Anyway, most entrants who realised the possible ambiguity, sent in the correct solution as well — which was 123341234. The winning solution came from Mr Kennedy of Brunswick, Victoria. Congratulations.

END

DIARY DATA

Readers are strongly advised to check details with organisers before making travel arrangements to avoid wasted journeys due to cancellations, printers' errors, etc.

Exhibitions

August 31 — September 6, 1987

Information Secesu '87

VIIIth Brazilian International Fair and the XXth National Congress of Information Systems, held at the Fair Hall, Sao Paulo.

Contact: Secesu-SP, Event Department — Information Secesu '87, 04533 Sao Paulo SP, Brazil

September 8-11, 1987

ACC '87

Australian Computer Society annual exhibition and conference. Major themes: manufacturing, banking, artificial intelligence, held at the Royal Exhibition Buildings, Melbourne.

Contact: ACC '87 Secretariat, Suite 7, 19-23 Hoddle Street, Richmond Vic 3121

September 14-18, 1987

IREECON '87

The 21st International convention and exhibition of the Institution of Radio and Electronics Engineers Australia, held at the Royal Agricultural Society Showground in Sydney.

Contact: IREE Australia, PO Box 79, Edgecliff NSW 2027. Telephone (02) 327 4822

September 23-24, 1987

Scanning Technology '87

First national exhibition and seminar/case study program on bar coding and other automatic identification and data entry systems, held at the

Wentworth Park Convention Centre, Sydney.

Contact: AIM PAC Secretariat (02) 958 1811

October 20-24, 1987

Computer Indonesia & Business Indonesia

Computer products and office technology exhibition held in Jakarta.

Contact: Australian Exhibition Services, Suite 3.3 Illoura Plaza, 424 St Kilda Road, Melbourne Vic 3004. Telephone (03) 267 4500

November 4-7, 1987

Queensland Computer Expo '87

A four day exhibition held at the RNA Showgrounds, Brisbane.

Contact: Robert Woodland Exhibitions, PO Box 280, Sunnybank Qld 4109. Telephone (07) 273 4066

Conferences

September 6-10, 1987

CMGA '87

The Group for Computer Capacity and Performance Management meeting will be held in Canberra.

Contact: Charlie Doherty (062) 47 2644

September 22 - 23, 1987

APCON

The Sydney PC Users Group's annual convention will be held at the Masonic Centre in Sydney.

Contact: APCON Coordinator, Geoff May (02) 699 3518 or the Group's President, Ron Pollak (02) 290 3655

September 28-30, 1987

Australian Computers in Education Conference

The conference will be held at the Adelaide Convention Centre.

Contact: Australian Computers in Education Conference, PO Box 931, Norwood SA 5067. Telephone (08) 332 1141

October 19-21, 1987 Auckland

October 21-23, 1987 Sydney

International Connectivity Symposium on Local and Wide Area Networks and Micro-Mainframe Links, organised by Digital Consulting Pacific (DCP).

Contact: Sara Mulvihill (02) 922 5532

November 1-4, 1987

Australian Joint Artificial Intelligence conference 1987

A four day conference covering three themes: research, applications and commercial endeavour.

Contact: AI'87 Secretariat, PO Box 929, Crows Nest NSW 2065. Telephone (02) 439 5133

November 25-27, 1987 Singapore

November 30 - December 2, 1987 Sydney

December 2-4, 1987 Wellington

International Computer Aided Software Engineering Symposium,

DIARY DATA

presented by Digital Consulting Pacific.
Contact: Sara Mulvihill (02) 922 5532

Courses & Seminars

September 2-4, 1987 Melbourne

September 9-11, 1987 Sydney

Three day seminar on SNA — architectures for the future held at the Old Melbourne and the Boulevard Hotel.

Contact: Housely Communications (02) 498 7877

September 7-8, 1987

Two day seminar on X.25 and related packet network protocols held at the

Boulevard Hotel, Sydney.

Contact: Housely Communications (02) 498 7877

September 7-8, 1987 Melbourne

September 17-18, 1987 Sydney

A two day seminar on software engineering principles presented by George Littlewood.

Contact: Management Technology Education (02) 290 3555

September 9-11, 1987 Melbourne

September 21-23, 1987 Sydney

Three day seminar on software quality assurance presented by George Littlewood.

Contact: Management Technology Education (02) 290 3555

September 15-17, 1987

A three day course on Unix system and shell programming organised by the Queensland Institute of Technology, Brisbane.

Contact: (07) 223 2196

END

Notice to organisers

Please send any information regarding forthcoming exhibitions, courses, seminars etc, to: **Diary Data, APC, 124 Castlereagh Street, Sydney 2030.**

USER GROUPS

Below is a list of updates and additions to the full User Group listing which is available to readers on request. Please send a SSA envelope to 'User Groups', APC, 124 Castlereagh Street, Sydney 2000.

Vic

The Smalltalk Users Group has recently been formed. Unfortunately no information was provided regarding venue or frequency of meetings.

For more details contact Doug Duke on (03) 836 3355.

NSW

The Sinclair QL Australia User Group was formed in February this year. The group meets on the first Thursday of each month at the Granville Library Rooms, 10 Carlton Street, Granville, commencing at 7pm. For more information contact the Chairman/Secretary, Mr Vadim Kuchin, PO Box 729, Parramatta NSW 2150.

Some updates from the Challenger User Group include a new Chairman/President — Gary Stark and a new Secretary/Treasurer — Ross Johnson. For further details contact Gary Stark on (02) 810 5118 or Ross Johnson (02) 963 4240.



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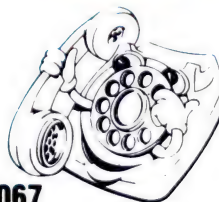
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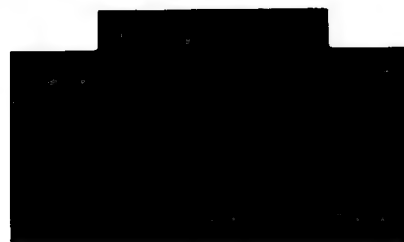
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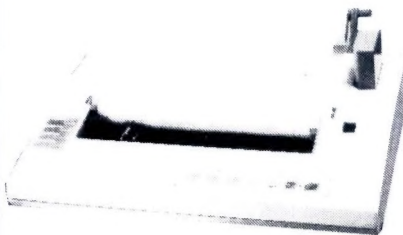
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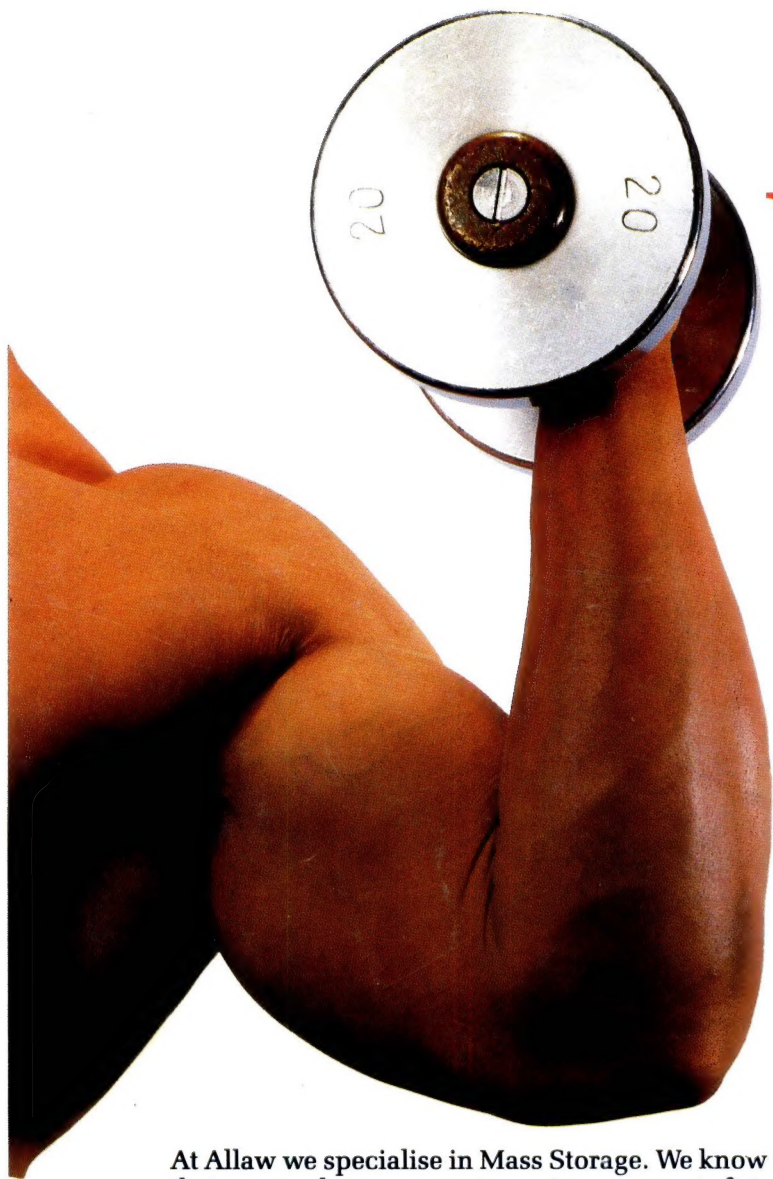
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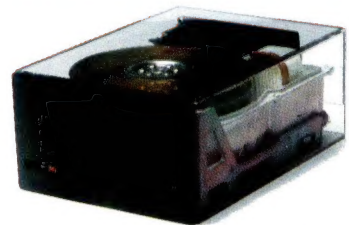
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